# The Niger Delta

## Aspects of its Prehistoric Economy and Culture

Nwanna Nzewunwa

Cambridge Monographs in African Archaeology 1

B A R International Series 75

1980

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B.A.R., 122 Banbury Road, Oxford OX2 7BP, England




Cambridge Monographs in African Archaeology




B.A.R. S-75, 1980: "The Niger Delta, Aspects of its Prehistoric Economy and Culture"





ISBN 9780860540830 paperback
ISBN 9781407350837 e-book
DOI https://doi.org/10.30861/9780860540830
A catalogue record for this book is available from the British Library
This book is available at www.barpublishing.com

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Dedicated to my mother Adanma
and late uncle Nwakuna
for their early interest in my education

PREFACE

This book is substantially the outcome of my doctoral thesis submitted to the University of Cambridge in 1979. It is divided into two parts. Part I is made up of four chapters which provide an introduction to the Niger Delta and the field studies. Chapter I outlines the history of research, aims and methods of the present investigation. Chapter II presents the general environmental conditions prevailing in and around the Niger delta in the last 10,000 years. Chapter III reviews current theoretical models in the study of prehistoric economies and their application to the Niger delta. Chapter IV uses field data to analyse and interpret the ecological factors that influenced human life in the delta, the distribution of resources and the response by human groups to this ecology in terms of their settlement strategy.

Part II consists of six chapters devoted to the archaeology of the Eastern Niger delta and the conclusions which can be drawn from it. Chapter V presents the results of archaeological fieldwork carried out in 1976/1977. Chapter VI applies the techniques of shell midden analysis to the assessment of Niger delta shell midden components studying especially their application to diet and population estimates. Chapter VII discusses the organization of the subsistence economies and applies the territorial concepts presented in Chapter III to the study of resource exploitation and the patterns of the delta economies. Chapters VIII and IX analyse and reconstruct the material, especially the ceramic traditions. Chapter X presents a model of human exploitation of the eastern delta from before 2000 B. C. to the present day.

I am indebted to the following individuals and establishments for help in the course of this research; in particular the following: the University Libraries at Nsukka and Cambridge, the state libraries at Enugu and Port Harcourt; the National Museum Lagos, the National Archives, Enugu and the Federal Surveys Lagos. Dr. F. N. Anozie generously allowed me to use his excavated but unstudied material and gave me access to his field notes. Mr. T. Green and the staff of the Rivers State Council for Arts and Culture Museum Port Harcourt and six volunteers from Okrika formed part of the field team at Okochiri. Mr. N. Tilleh provided technical assistance in the field and with Mr. J. Ugwuanyi drew some of the pottery specimens. The technical staff of the Archaeology Laboratory University of Nigeria Nsukka helped with processing the column samples. Mr. J. Alibo was a most cheerful and hardworking field guide. My wife gave useful suggestions about human nutrition especially on feeding patterns of delta people and also spent two weeks in the field in April 1977 helping with experiments on methods and periods of preservation for different species of shellfish. The Department of Soil Science, Nsukka, analysed the soil samples from Okochiri. Drs. M. O. Iwuala, N. M. Inyang and A. B. C. Nwosu, all of the Department of Zoology, Nsukka, respectively identified the bones from Ogoloma, the bones from Okochiri and the mollusca. Mr. Bruce Powell of the University of Port Harcourt and Mr. David Reese of Cambridge helped with the study of

Niger delta mollusca and bones from Okochiri respectively. Dr. (Mrs.) M. Sowunmi of Ibadan University is undertaking the palynological analysis and Dr. T. Hamada of the Institute of Physical and Chemical Research, Saitama, Japan, carried out the radiocarbon dating of samples from Okochiri. The University of Nigeria under a Junior Fellowship scheme sponsored my studies in Cambridge and the fieldwork in Nigeria. My brothers also supplied funds for the fieldwork and St. John's College, Cambridge have contributed generously towards the preparation of the script.

I must thank the Department of History/Archaeology, University of Nigeria, Mr. Numa, the Secretary of Okrika Local Government Council, the Rivers State Research Council, Port Harcourt, the Alagoas of Nembe, Chief Ogazi of Ke, Chief Alison Ibuluya of Okrika for much help and the Tominaros of Okochiri for permission to excavate on their land.

I must express special gratitude to Drs. J. Alexander, D. W. Phillipson, G. Bailey who read the script in full or in part, to Mr. M. Jarman, Professor N. David, and, posthumously to Mr. Eric Higgs for useful advice, to the staff and research associates in the Bone Room Faculty of Archaeology and Anthropology, Cambridge and visiting Scholars for useful exchange of ideas. I am immensely indebted to my wife and children Adanze and Ikenna for patiently enduring my absence while this work was in preparation.

Finally I am indebted to those who permitted me to reproduce their published and or unpublished materials.

Port Harcourt
October 1979

Nwanna Nzewunwa

# PART I

# INTRODUCTION, THEORY AND ECOLOGY

# CHAPTER I

## INTRODUCTION

The Niger delta is the largest delta in Africa, covering over 35,000 square kilometres (Fig. I. 1-3). Along the Atlantic coast of Nigeria it has a convex front which forms a broad arc stretching for about 350 km from the Benin to the Bonny Rivers (Fig. I. 3) (Buckle 1978). From its apex at Aboh southwards, the Niger delta as conceived in this study is made up of four distinct ecological sub-zones: 1) the freshwater swamps and forests on both sides of the Niger; 2) the coastal plains on the west and east of the freshwater swamps; 3) the saltwater mangrove swamps, south of the freshwater and coastal plains sub-zones, made up of mud and silt; 4) the sandy beach ridges just at the front of the outer delta (Udo 1978). A comprehensive analysis of these sub-zones is given in Chapter IV.

Alagoa (1972) divides the Niger delta into three sections; the west, the central and the east, although he recognizes fringe zones within these sections. This book studies only his eastern section which is the home of various linguistic and ethnic groups that inhabit the 17,000 square kilometres from the Nun River $6^{o}04'$ E to the mouth of the Imo River $7^{o}$ 32' E on the Atlantic. The northern limit is about $5^{o}$ 30' N on the River Niger then east and southeastwards.

The general problem chosen for study was the human exploitation of a delta in sub-Saharan Africa and the particular example was the eastern delta. This area has been selected for study for the following reasons:

1) It offers varied ecological sub-zones for various resources of importance to human exploitation and therefore satisfied an orientation towards a study of prehistoric economy.

2) The basic patterns of the subsistence economy have probably remained largely unaltered for the past three centuries when documented evidence on delta life begins to accumulate. This makes the application of ethnographic analogy useful.

3) There is ample historical, ethnographical and linguistic data which enables us to gain some insight into the life in the delta at the European contact and post-contact periods.

4) There is also some excavated data waiting for analysis and interpretation.

5) The existence of the Rivers State Research Scheme with interest in archaeological research made the Niger delta a convenient area from where to start this study.

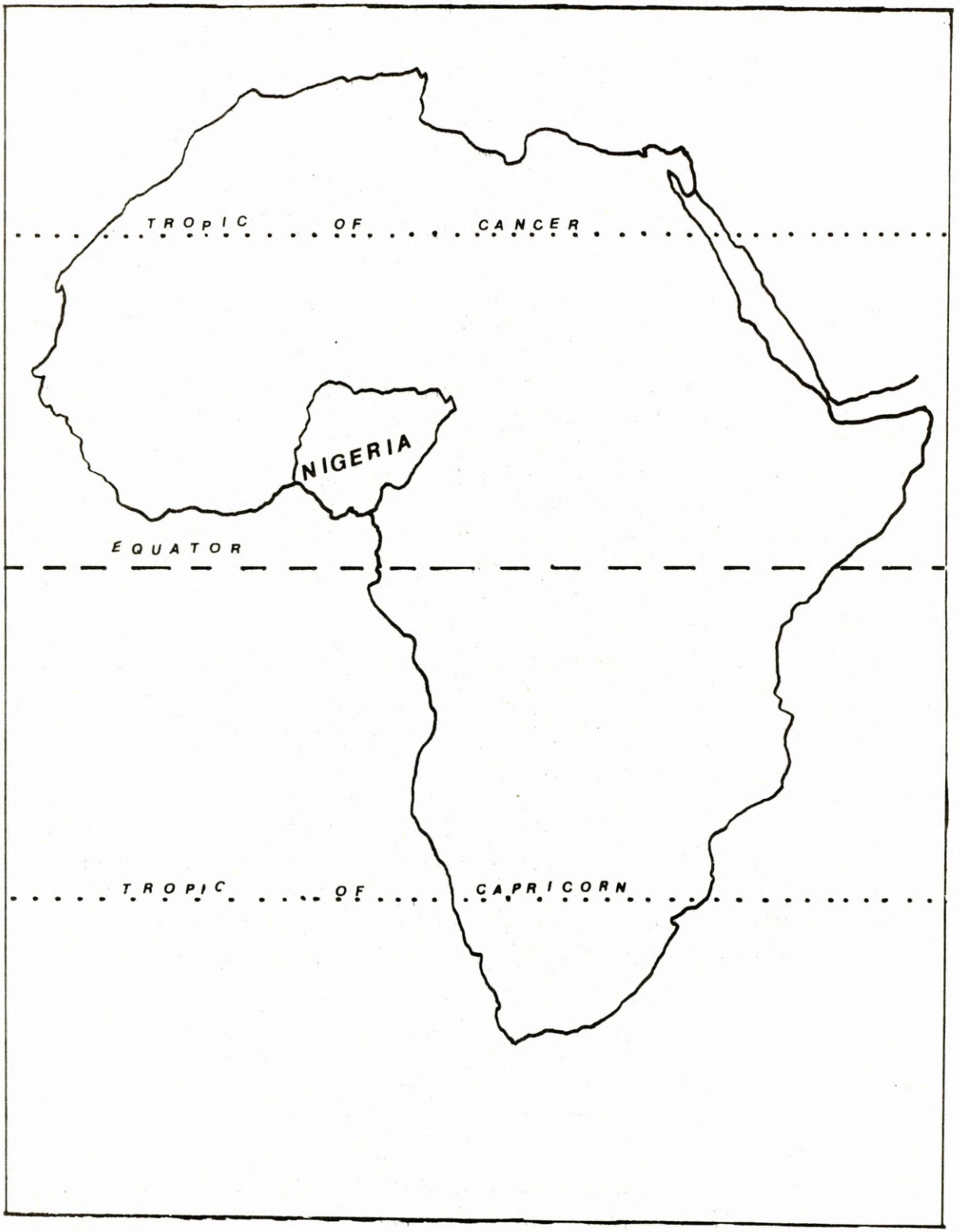



FIG. I.1 Map of Africa showing position of Nigeria

State of Archaeological Research in S. E. Nigeria

Although a museum had been opened at Oron in 1952 no archaeological fieldwork was undertaken in eastern Nigeria until 1959. In 1938 a man found bronze objects while digging a cistern in Igboukwu. Mr. Field, then administrative officer for Awka, had bought some of these 1938 finds and subsequently presented them to the Nigerian Antiquities Department. In 1959/60 Professor Thurstan Shaw who was invited to investigate these finds, carried out excavations at Igboukwu, the first of such archaeological work in eastern Nigeria. In 1964 he continued the excavations at Igboukwu (Shaw 1970, 1977).

In 1960 when the University of Nigeria (Nsukka) was founded, a joint Department of History and Archaeology was created. But field archaeology did not begin until 1963 when Professor Hartle took up the post of archaeologist at the University. Hartle, between 1963 and 1967, located 400 archaeological sites and carried out fourteen excavations in the former Nsukka, Awka, Okigwe and Bende divisions (Hartle 1967).

In 1971 the Rivers State Government established a River State Centre for Arts and Culture with an emphasis on research including archaeology. This state therefore became the first in Nigeria, besides the Federal Department of Antiquities and the universities, to sponsor archaeological research. The first archaeological reconnaissance in the Niger delta was conducted in December 1972 by two archaeologists, Professor Shaw and Dr. Anozie, and an historian, Professor Alagoa. In four field seasons between 1973 and 1976 Dr. Anozie (1973, 1976) carried out excavations on nine shell middens at Onyoma, Saikiripogu, Ke and Ogoloma.

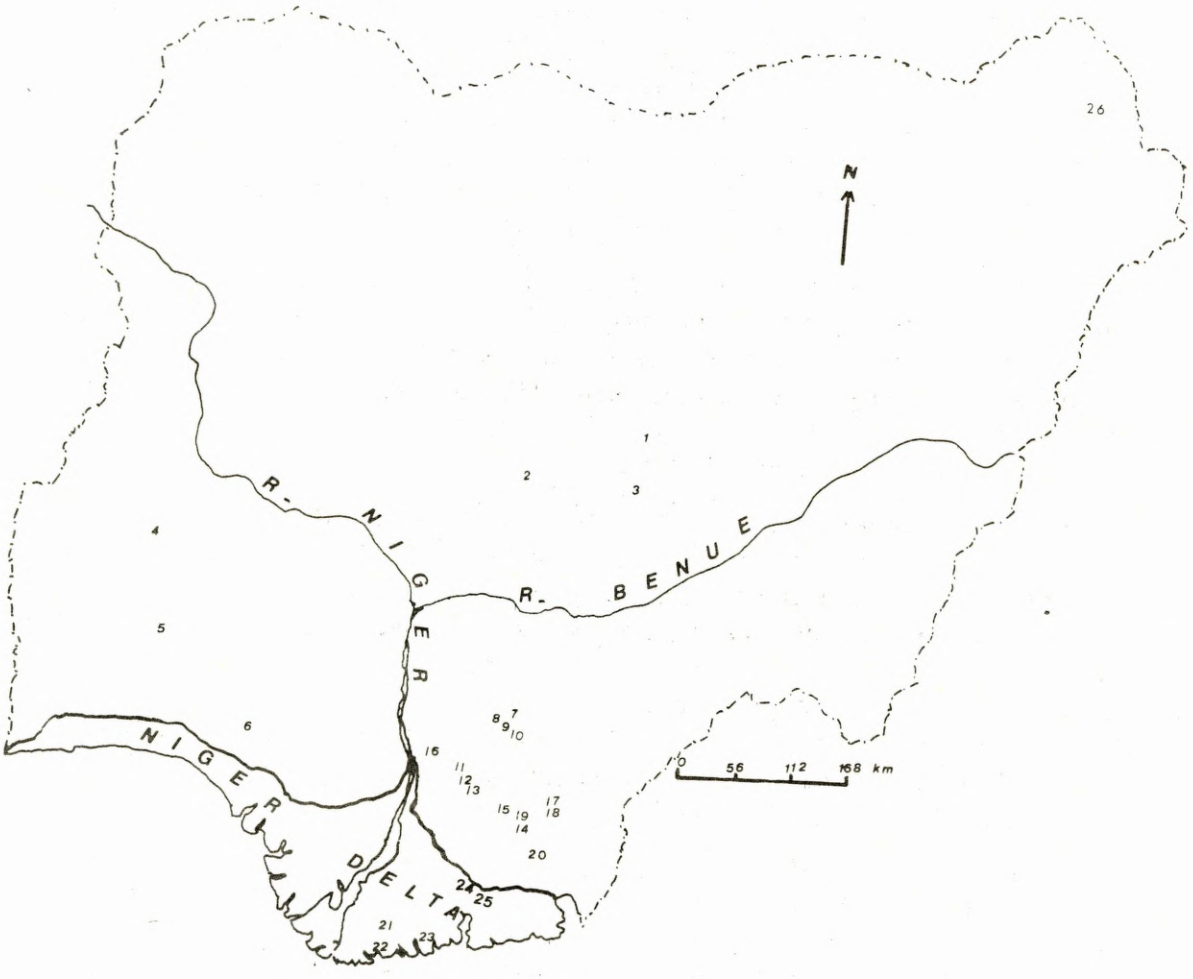
In August 1974 Professor Hartle assisted by the present writer excavated an old settlement site at Afaha Obong near Ikot Ekpene—the first in the lowland plains of eastern Nigeria. In the following year Vincent Chikwendu conducted field survey and excavations in Afikpo (Chikwendu 1976). Drs. Andah and Anozie (1976) returned to Afikpo in August 1976 to re-excavate the Ukpa rockshelter formerly excavated by Professor Hartle in 1966 but from which no records and artefacts are now available following the ravages of the Nigerian civil war.

In March 1976 Dr. Anozie excavated the iron-smelting site of Umundu north of Nsukka (Anozie (1976b) 1977 pers. comm.).

The present writer undertook field survey in the eastern Niger delta and excavations at Okochiri in 1976/77 (Nzewunwa 1978, 1979), survey work in parts of Owerri (Obibi and Awaka), excavations at Umukete Aguleri in March/April 1977 and the survey of the Anambra Valley in September 1977 under the direction of Dr. Anozie. Excavations are in progress at Ugwele, in Okigwe and at Obolo Afor (Anozie, pers. comm.) (Fig. I.2). For a brief account of these excavations see Nzewunwa (1979:394-418).

Aims and Objectives

In approaching archaeological research in the Niger delta the archaeologist Anozie stated that "the aims included an attempt to establish the nature and age of the earliest settlements in the Delta and to compare them with estimates based on oral traditions and linguistics" (Anozie 1976a:1). In




1. Jos
2. Nok
3. Rop
4. Old Oyo
5. Ife
6. Benin
7. Umundu
8. Isiugwu Obukpa
9. Nsukka University Farm
10. Okpe Igara
11. Ezira
12. Enugu Ekwu
13. Igboukwu
14. Alike
15. Etiti Ulo
16. Umukete
17. Ukpa
18. Afikpo
19. Ugwuele
20. Afaha Obong
21. Onyoma
22. Saikiripogu
23. Ke
24. Ogoloma
25. Okochiri
26. Bornu

Figure 1.2 Nigeria: Some Sites Mentioned in the Text

pursuit of this objective Anozie's excavations on nine shell middens had succeeded in supplying a series of radiocarbon dates to Niger delta chronology (see Chapter X).

In like manner Shaw in a recent book on Nigerian archaeology and early history, writes that "Just when the Niger Delta was first colonized and a way of life evolved to exploit its highly specialized type of environment, is one of the problems awaiting Nigerian archaeology" (Shaw 1978:51).

The present investigation is primarily oriented towards answering three related questions: 1) what are the ecological and archaeological manifestations of delta way of life in terms of their basic subsistence economy? 2) what are the material cultural manifestations of delta way of life? 3) for how long has this way of life been in operation?

## Materials and Arrangement

To recover and analyze the data needed to answer the questions we are asking requires the application of methods beyond those used in conventional archaeological researches. The methodological stand of this book is therefore that prehistoric economies and material culture are best investigated by a combination of techniques and concepts from various disciplines.

## Data Categories

In studying aspects of economy and material culture in the delta four interrelated data categories were considered: the environmental, biological, archaeological and ethnographic.

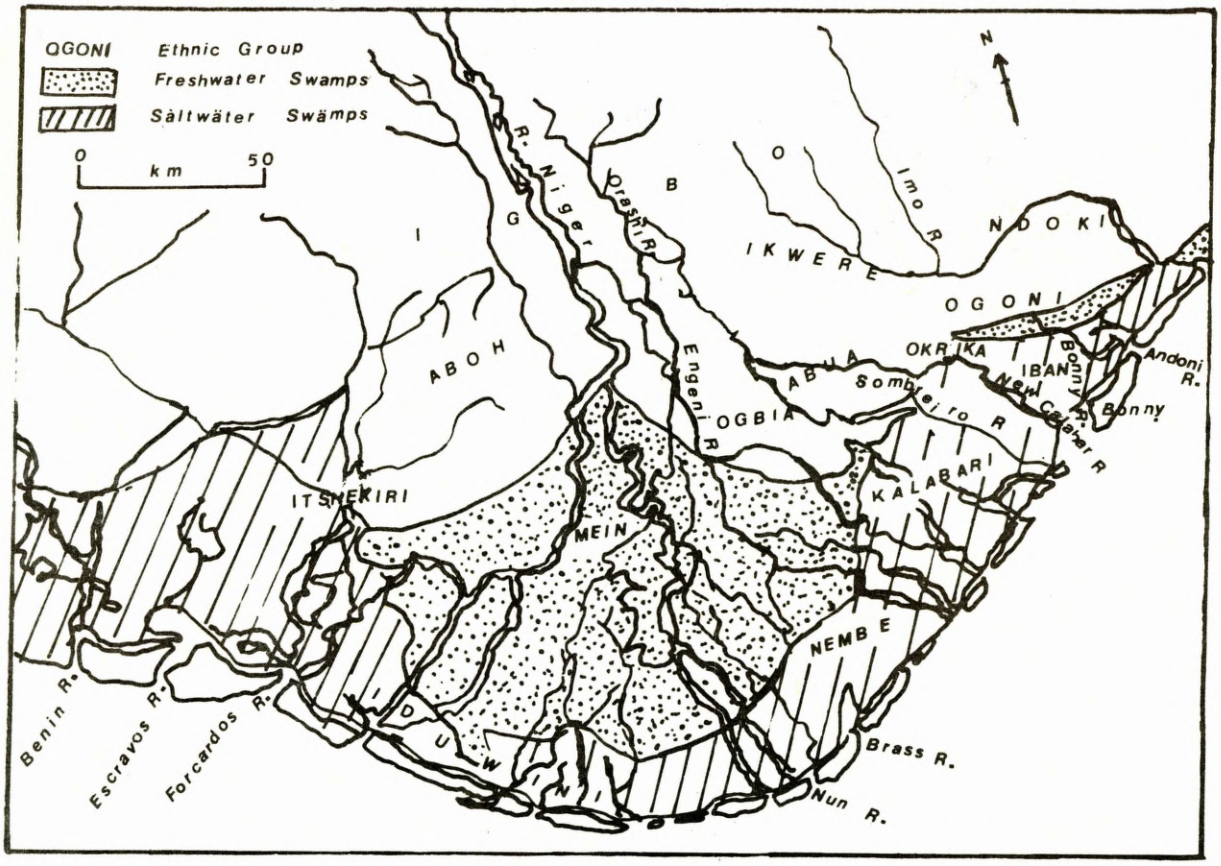
### a) Environmental Data

Every economy functions within a physical environment which provides the resources the economy exploits. Butzer's (1964) method of assessing the man-land relationship in archaeological research uses data from anthropology, the physical and biological sciences. The regional approach involves the analysis of climate, physiography, vegetation and geology and resources while in a localized approach the site setting is studied. Examples are those of MacNeish (1967a, 1967b) and Streuver (1968a) which emphasize a micro-environmental approach in the study of communities with a low technological base.

Although environmental determinism has been discredited as a concept it need be borne in mind that an understanding of the environmental setting of a region or parts thereof is a prerequisite for an analysis of the ecological dynamics and the economic patterns prevailing in the area. Studies in prehistoric environments are limited for Nigeria and hardly exist for the Niger delta. However, a survey of the available geographical literature (NEDECO 1959, 1961, Floyd 1969, Murrat 1970, Novelli 1974, Buchanan and Pugh 1969, Ofomata 1967, Udo 1970, Keay 1949) points to the absence of major environmental barriers in eastern delta which could have hindered the easy mobility of people, ideas and materials.

The present study used maps and aerial photographs to distinguish different environmental zones; footwalking over sites and areas; and canoes to

Fig. I.3 The Niger Delta



ply the maze of creeks for a closer observation and charting of vegetation and morphological zones, the terrain and the resource distribution. Questions were also asked of the local people relating to the effects of the seasons, floods and tides on their lives. A useful source of palaeo-environmental information, and one in which the Niger delta has made a good start is palynology (Sowunmi 1976).

The environmental data which puts the eastern delta in proper perspective vis-à-vis its close neighbours is presented in Chapter II; while the ecological data that bears relevance to resource and human distribution within the delta is presented in Chapter IV.

b) Biological Data

The concept of resources maintains that resources result from the interaction between man and the rest of the physical world. The choice of and importance attached to any resource depends largely on the size and distribution of human numbers, their needs, desires, values and status.

The biological data which result from these resources may be broadly grouped into two: plants and animals. These form the food materials very important to man. Methods developed for the study of plant and animal resources use quantification techniques to determine the actual size of the population of the species under consideration. Different scholars have used various methods (see Chapter III), for example, population density, land area (Heider 1972), carrying capacity (Slobodkin et al. 1967; Allan 1947; Street 1969; Shawcross 1970; Zubrow 1975). We are hindered from the exploitation of some of these techniques in our study area mainly because of a dearth of documents with quantitative data relating to settlement sites and patterns.

Confronted with these problems the study has pursued a reconstruction of prehistoric economies based on evidence of food remains, technology and site locations. Even here the food remains are incomplete as a result of differential preservation, excavations shortcomings and the limited scale of research. To complement the archaeological records it was necessary to employ the techniques of Site Catchment Analysis (Higgs 1972, 1975) to assess the sites under study with a view to obtaining the maximum information about the off-site data (Chapter VII). The shortcomings of this model have been identified (Chapter III).

However combined with ethnographic and oral sources the biological data confirm that people in the Niger delta extensively used different species of shellfish, fish, terrestrial and marine mammals on the one hand and various species of wild and cultivated plants and vegetables on the other (Chapters IV-VI).

c) Archaeological Data

Three levels of archaeological data were identified and utilized. The first level relates to any archaeological data acquired prior to the present study. As no previous archaeological work had been done in this field before the present decade, what is available resulted from the collaboration of the Rivers State Research Scheme and the Department of Archaeology, University of Ibadan, pioneered by Professors Shaw and Alagoa and Dr. F. N. Anozie.

The second level resulted from the field survey, for the location of new sites and re-evaluation of the already excavated sites, carried out by the present writer in 1976-77. The third level of archaeological data comes from the excavations in Okochiri and the series of column samples taken from other delta middens.

Beyond the conventional techniques of excavation, specialized techniques for the study of shell middens normally referred to as midden sampling and midden analysis, were applied, the objective being the maximum recovery of data relating to the economy (Chapters V and VI). These are treated below in some detail, but because similar techniques were not utilized in the pre-Okochiri excavations, it became necessary to collect columns of samples from these sites for on-the-spot and laboratory processing. The results of this series of materials and analyses made it possible to assess the place of shell-fish, fish and animal resources in the subsistence economies of the delta (Chapter VI). This was facilitated by the application of ethnographic models to the interpretation of the data.

d) Ethnographic Data

The issue of ethnographic analogy in archaeological investigation has been controversially and widely discussed (Ascher, 1961, 1962; Binford 1967, 1968; Chang, 1967; Anderson, 1969; Heider, 1968; Campbell, 1968). Given the limited geographical space of the Niger delta and the degree of cultural continuity demonstrated in the material data and the evidence that the environment has undergone no drastic changes in the last five millennia, the application of ethnographic analogy in the present research is justified within the bounds specified by Dozier (1970:203-205).

The use of ethnographic analogy has been found useful in cultural ecological studies (Coe and Flannery 1964; Fitzhugh 1972). Following Fitzhugh (1972:47) three levels of ethnographic analogy were utilized: 1) specific analogy in which the ethnographic data are used to interpret archaeological material where the direct historical or contemporary approach holds; 2) functional analogy, where the approach ranges from specific tool function to the interpretation of functional activity sites or subsistence patterns; and 3) ecological analogy in which ethnographic cultural ecology is applied to an archaeological pattern to the interpretation of the subsistence-settlement system of the group.

# CHAPTER II

## ENVIRONMENTAL SETTING

The environmental background given here is not an end in itself but structured to offer a clear understanding of the study as a whole. The study views eastern Nigeria as an environmental continuum and the presentation here hopes to show the Niger delta in relation to other parts. A closer, more definitive synthesis of the delta is given in Chapter IV.

### 1. Geology

An understanding of the features of eastern Nigeria in terms of the geomorphology, drainage, human settlement patterns and economic activities requires a brief discussion of the general geological structure (Fig. II. 1).

The area rests upon a basement complex made up of metamorphic rocks with intrusive granitic bodies which are overlain by a series of much younger Cretaceous and Tertiary sedimentary strata both of marine and continental origin (Monkhouse 1966; Floyd 1969).

Stratigraphic and palaeogeographic studies (NEDECO 1961; Reyment 1965; Murat 1970; Weber 1971; Weber and Daukoro n. d. ; Novelli 1974) show that three tectonic phases coupled with transgressive and regressive movements of the ancient sea were responsible for the present geological structure of the area. The first tectonic phase of Albion age, gave rise to the Abakaliki-Benue trough with northeast to southwest trending faults. The trough was limited westward by the Benin flank and eastwards by the Calabar flank outlined by northwest to southeast trending faults. Between the Abakaliki- Benue trough and the Benin flank was the Anambra platform.

The second phase, starting in Santonian age, resulted in the uplifting and folding of the Abakaliki-Benue belt and the formation of the Anambra basin. This basin was filled in a dual stage sedimentary sequence. It is also suggested that the delta started growing during the second cycle between Camparian and Palaeocene transgressions.

The third phase of late Eocene age, and still active, was outlined by positive movements, chiefly in the northeastern and eastern parts of the basin. This determined the configuration of the modern Niger Delta (Novelli 1974). The Niger Delta belongs to the recent era and is floored by deltaic deposits of the river Niger. These deposits, consisting predominantly of coarse sands, gravels, dispersed layers of silty clay, peat and decomposed organic matter, are unconsolidated and sedimentation continues at a very high rate (NEDECO 1959). (See Chapter IV. )

The oldest of the geological formations within the Niger Delta, the Coastal Plains Sands of Mio-Pliocene Age, covers the area immediately north of the Recent Era formation.

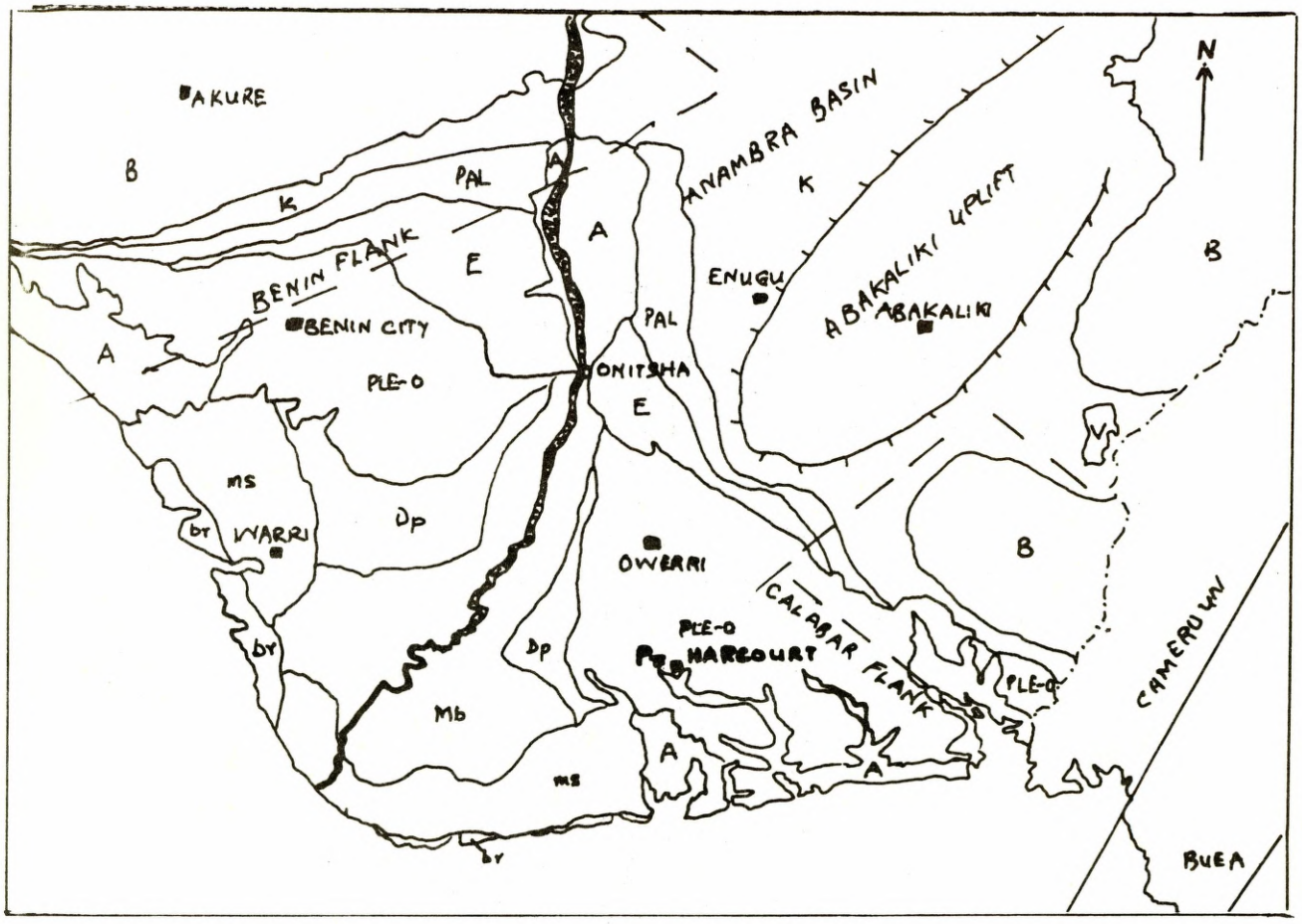



Figure II. 1 Eastern Nigeria: Stratigraphy and Megatectonics

| | |
|---|---|
| A | Alluvium |
| br | Beach Ridges |
| ms | Mangrove Swamps |
| Mb | Meander belt: freshwater swamps |
| Dp | Deltaic Plains (Warri to Sombreiro) |
| PLE-O | Oligocene to Pleistocene |
| K | Upper and Lower Cretaceous |
| B | Undifferentiated Basement Complex; intrusive and megamorphic rocks |
| V | Tertiary to Recent Volcanoes Pre-Oligocene Fault System |
| PAL | Paleocene |
| E | Eocene |

## 2. Relief and Drainage

The land surface of eastern Nigeria is composed of level or moderately undulating plains. There is a conspicuous absence of major hills and mountains. The Niger Delta, the broad Coastal Plain and the Cross River Basin form about 70% of the total land surface, making it rather uniform and monotonous. Elevations nowhere exceed 120 m above sea level (Fig. II. 2).

The absence of major relief obstacles, rapids and waterfalls, has had a tremendous effect on the mobility of people and ideas overland and by water, on settlement pattern and demographic configurations in historic times and probably in prehistoric times (TAHAL 1962; Floyd 1969). The level landscape and well drained soils have in addition helped in turning eastern Nigeria excluding the delta into the most densely settled areas of tropical Africa.

Eastern Nigeria may be divided into five broad physiographic regions—the Eastern uplands, the Cross River Basin, the Plateaux and Escarpments, the Coastal Plain, and the Deltas and River Plains. Each is again divisible into sub-regions (Figs. II. 3 and 4).

### a) The Eastern Uplands

These are made up of the Obudu Plateau (1824 m asl) and the Oban Plateau (1146 m asl). Within each of these are minor plateaux, deep valleys and deeply incised streams, making the topography difficult to traverse and resulting in sparse settlement.

### b) The Cross River Basin

The Cross River rises in the Cameroon mountains and empties into the Bight of Bonny (Biafra). This is an area of numerous streams, the major ones being the Amboine and Enyong. Elevation is not usually above 90 m asl. It is suggested that the scattered hills, an important feature of this area, were large enough for supporting fortified villages in earlier times.

### c) The Plateau and Escarpments

This area is made up of a sequence of plateaux, cuestas, well-defined escarpments and associated lowlands. These have been closely studied (Ofomata 1967a, 1967b, 1973a, 1973b). Major features of this region are the Nsukka-Udi Sandstone Plateau and Escarpments (588 m at Ukehe) to the west of which is the Anambra-Niger Rivers flood plains (Fig. II. 5).

The Plateau is a region of dry valleys with only two principal rivers—Adada and Ajali. One intriguing feature of this region is that despite the obvious lack of surface water, especially in the dry season, settlement on the plateau is very dense—an average of 375 per km in Nsukka and about 813 per km in the Enugu-Ezike area. It has been observed that the presence of dry valleys are inconsistent within humid tropical landforms but explanations offered for their occurrence are in no way very clear (Jungerius 1964; Floyd 1969; Ofomata 1977). This issue is further explored below in the section on water and human settlement.

Within this physiographic region are flat top hilly outliers which have provided excellent natural sites for fortified hill top residences and for terrace farming—features that still persist in the Nsukka and Awgu areas.

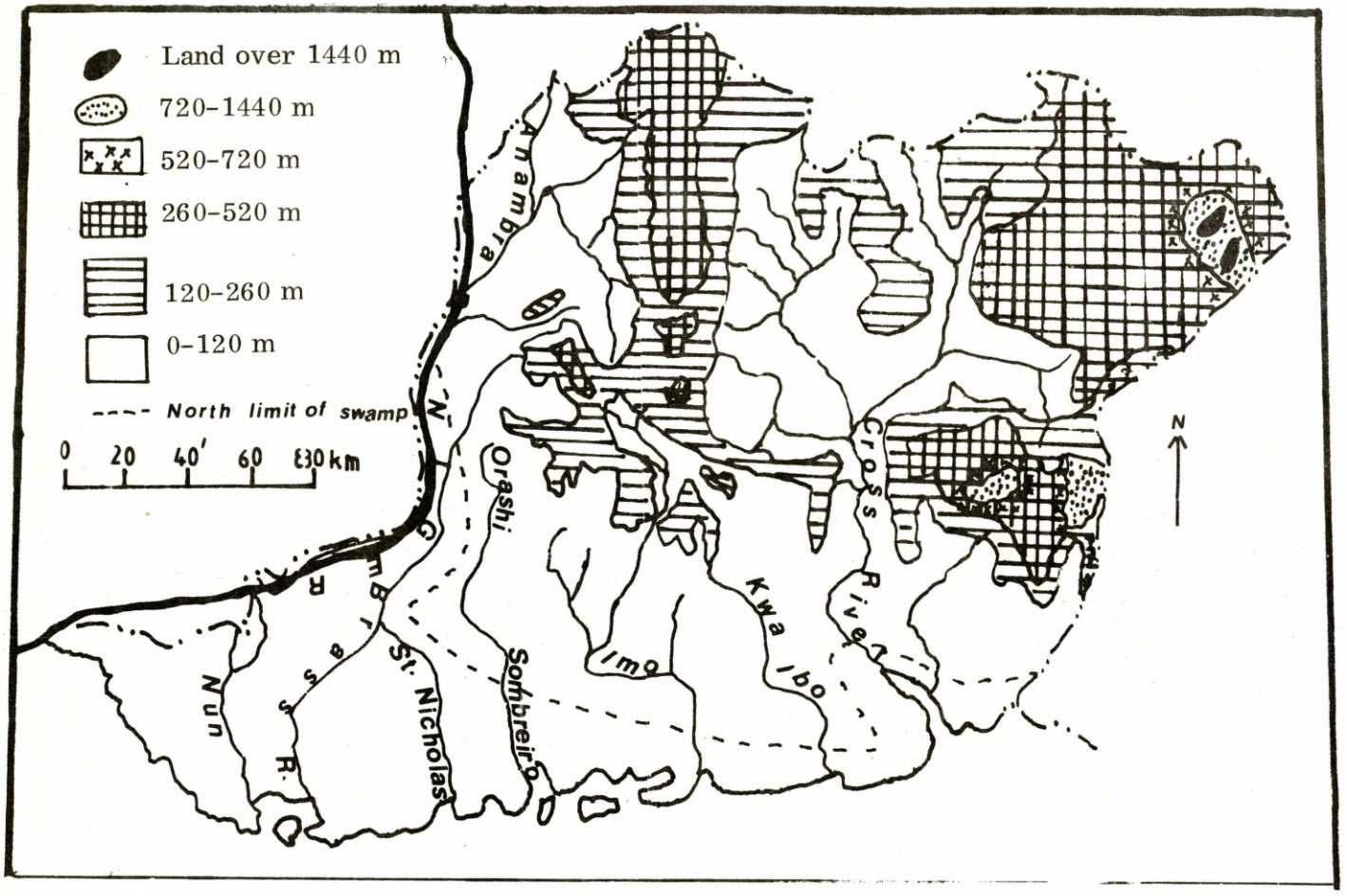



Figure II. 2 Eastern Nigeria: Relief and Drainage

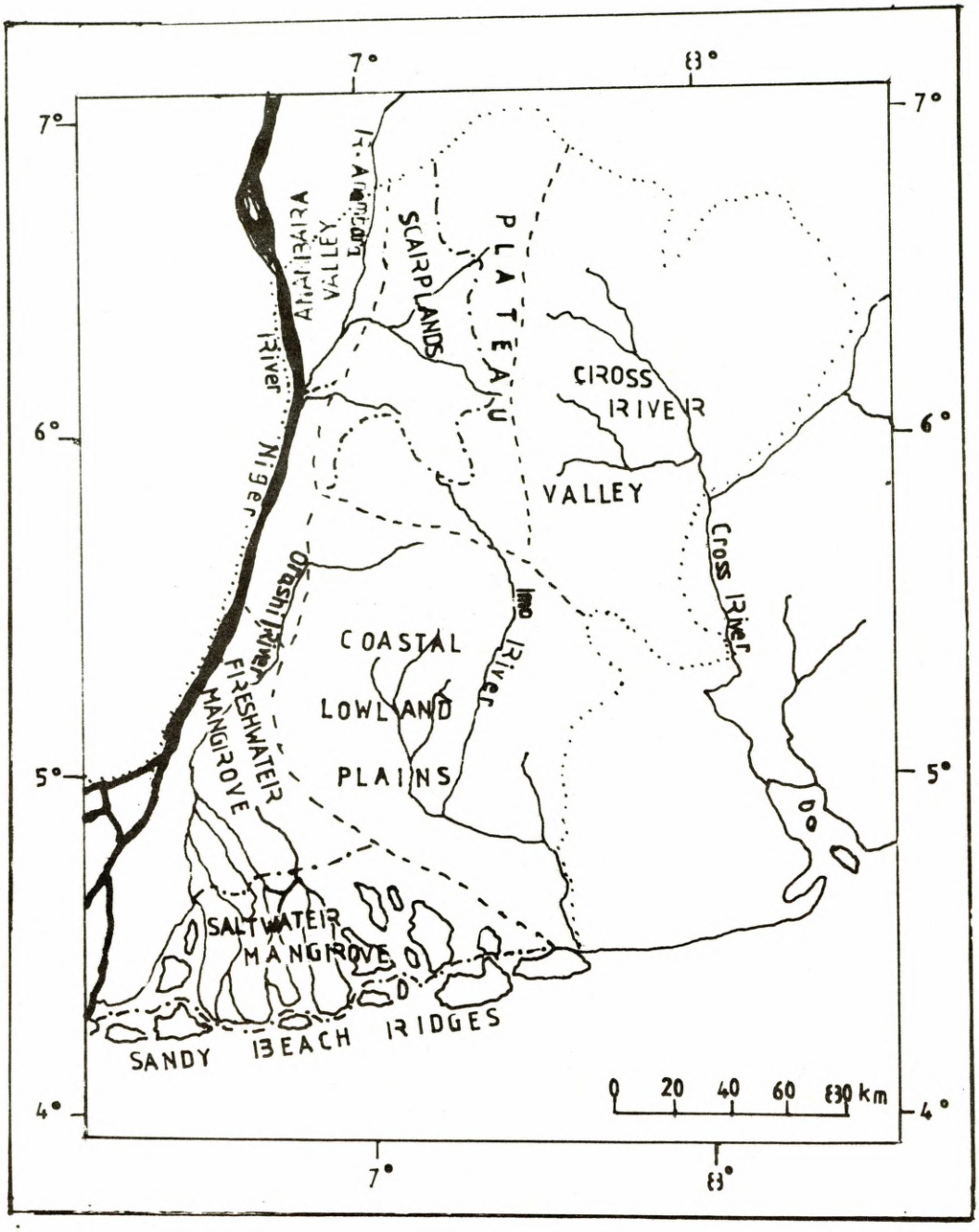
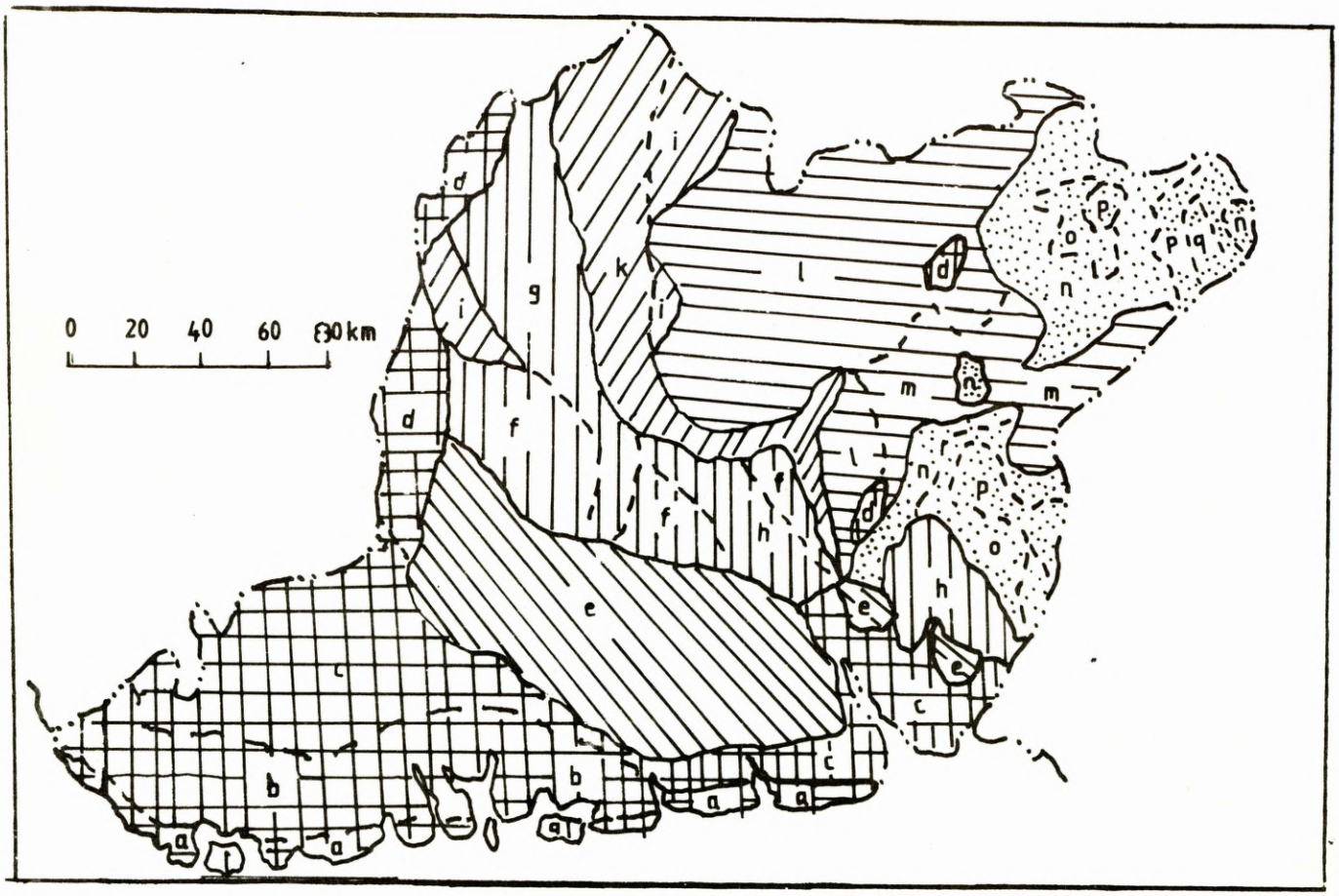



Figure II. 3 Eastern Nigeria: Physiographic Divisions




The Deltas and River Plains
- a Sandy beach ridges
- b Tidal creeks and mangrove swamps
- c Sandy delta plains and freshwater swamps
- d River flood plains

The Coastal Plains
- e Flat coastal plains

Plateaux and Escarpments with Associated Lowlands
- f Rolling Dissected lowlands
- g Undulating lowlands
- h Incised diversified lowlands

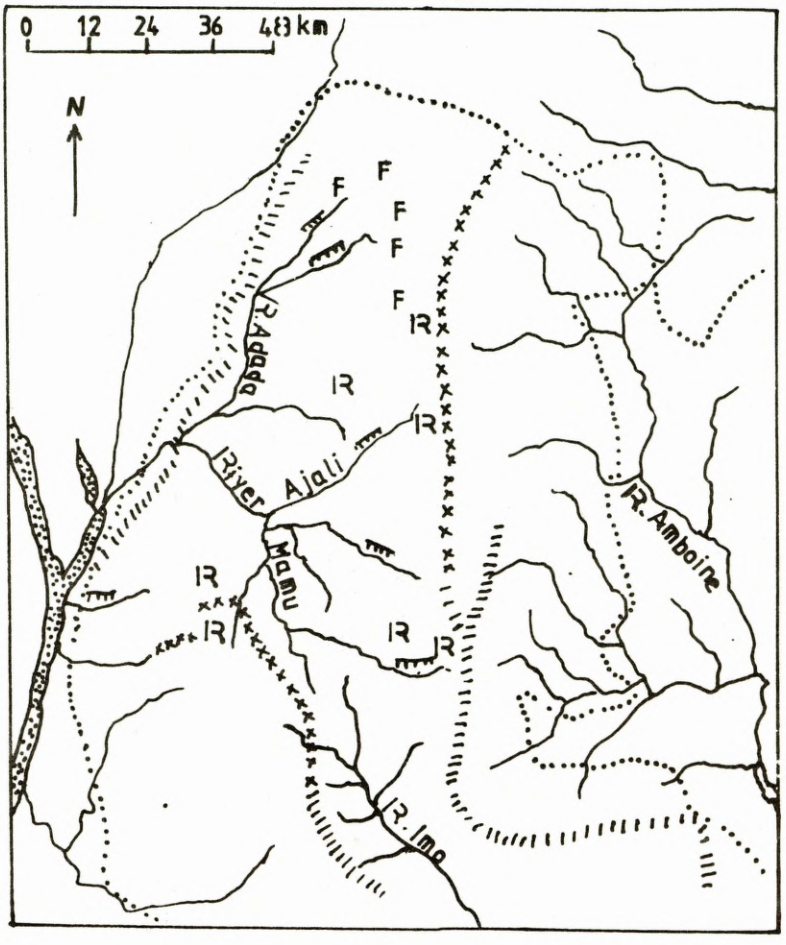
Plateaux
- i Strongly dissected plateau
- k Plateau extending above 395 m, gentle dip slope

Cross River Basin
- l Slightly incised plains
- m Rolling plains and dissected hills

Eastern Uplands
- n Rolling plateau above 265 m
- o Dissected plateau above 395 m
- p Strongly dissected plateau above 525 m
- q Rugged mountain above 985 m

(Modified from Floyd 1969 after K. Karmon 1966)

Figure II. 4 Eastern Nigeria: Landforms




Incised valley
Gullies
Escarpment
Round-topped hill
Flat-topped hill
..... Limit of Scarpland

Figure II. 5 Eastern Nigeria: Plateau and Escarpments

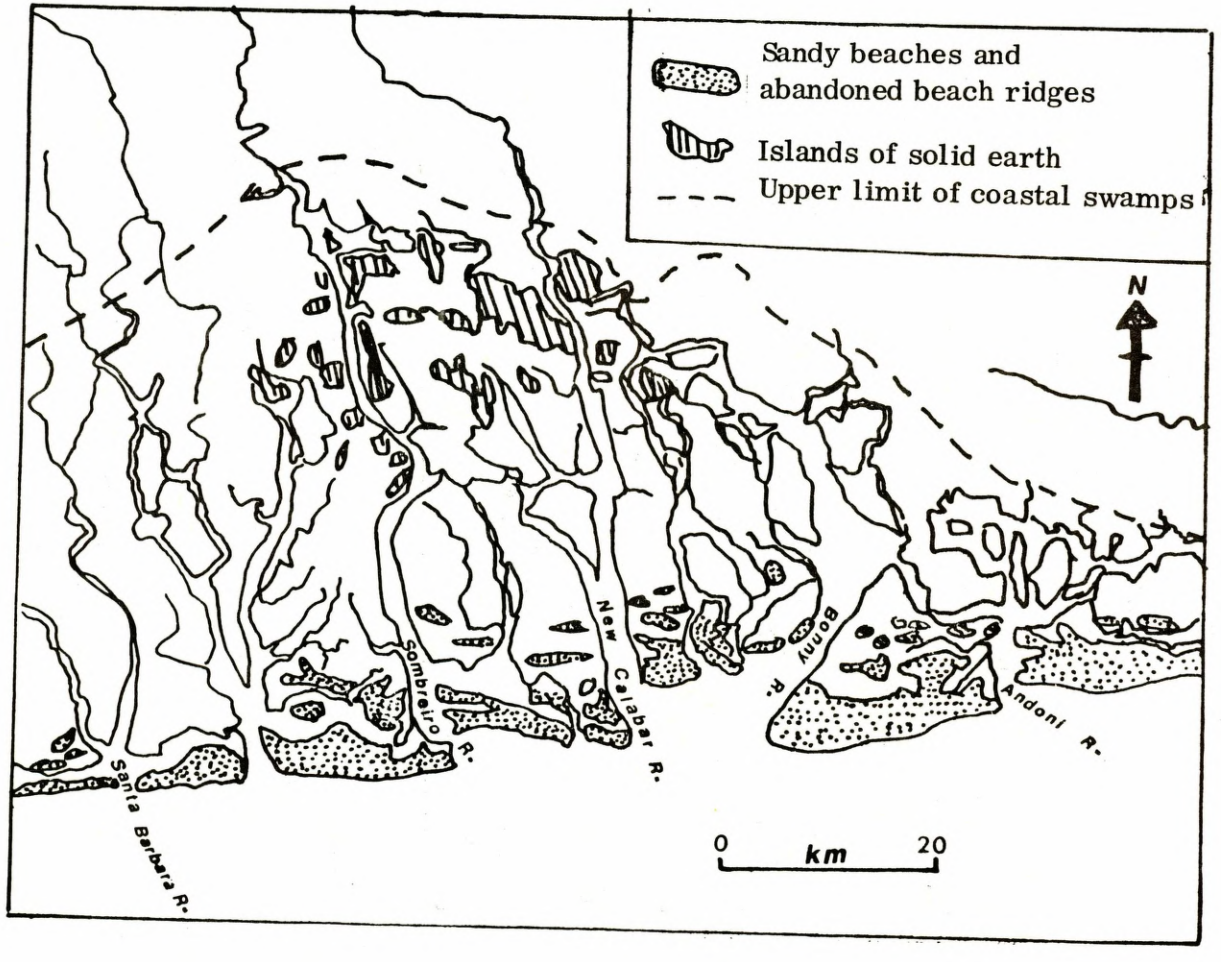



Figure II. 6 Morphology of the Eastern Niger Delta

d) Coastal Plains

Physiographic differences are hardly noticeable in this region with relief rising from tens of metres to a few hundred metres. It is essentially flat and the source of very few rivers because of its insignificant elevation and highly permeable substrata which permit only very small run-off. The major rivers are the Imo with its source in the plateau, the Otamiri, Aba and Kwalbo (Pugh 1961). This is an area of very dense settlement and population pressure on available land.

e) The Deltas and River Plains

Most of the region rises slowly and gradually northwards from zero to 40 metres. The Niger Delta is aptly subdivided into three sections (Floyd 1969; Udo 1970; Ofomata 1975). Along the coast is an area of sandy beaches and ridges at the north of which is an area of tidal creeks and mangrove swamps; north of the former and east of the latter is a seldom-flooded, sandy plain closer to the lowland coastal plain but part of the Niger flood plain. (See Fig. II.3 a and b.)

The Niger-Anambra flood plain is of interfluvial nature consisting of alluvium created by the Niger and Anambra rivers and their sediments and shared by the Orashi (Engeni) further south. Major features of the flood plain are the annual inundation at high flood and a characteristically low population density.

Within the Niger delta, floods pose a problem, dry land for settlement is scarce and the lack of drinking water threatens settlements.

3. Climate

The climate of eastern Nigeria is determined by an annual cycle of two air masses, namely a cool and humid maritime air mass (January-August) and a dry continental mass from the Sahara (August-January). The former accounts for the wet season while the latter is responsible for the dry season (NEDECO 1954, 1961; Buchanan and Pugh 1969). The climate is also characterized by uniformly high temperatures.

a) Rainfall

The average annual rainfall decreases from over 2,500 mm in the extreme south to just about 1,500 mm along the northern boundary of the region. While the wet season extends generally from March to November near the coast, it is usually shorter farther north; the dry season increasing from about two months in the southern parts to about five along the northern boundary (Fig. II.7).

The critical factor of the rainfall lies in the seasonality and the nature and intensity of the falls rather than their total annual amount. Outside of the coastal areas the rainfall has a well-marked seasonal distribution. However, the rains usually come in the form of intense, violent showers of short duration especially at the onset and end of the wet season. In most inland sections of the region, a continuous rainfall of two or more hours may have the climax of its downpour during the first half to three-quarters of an hour. This type

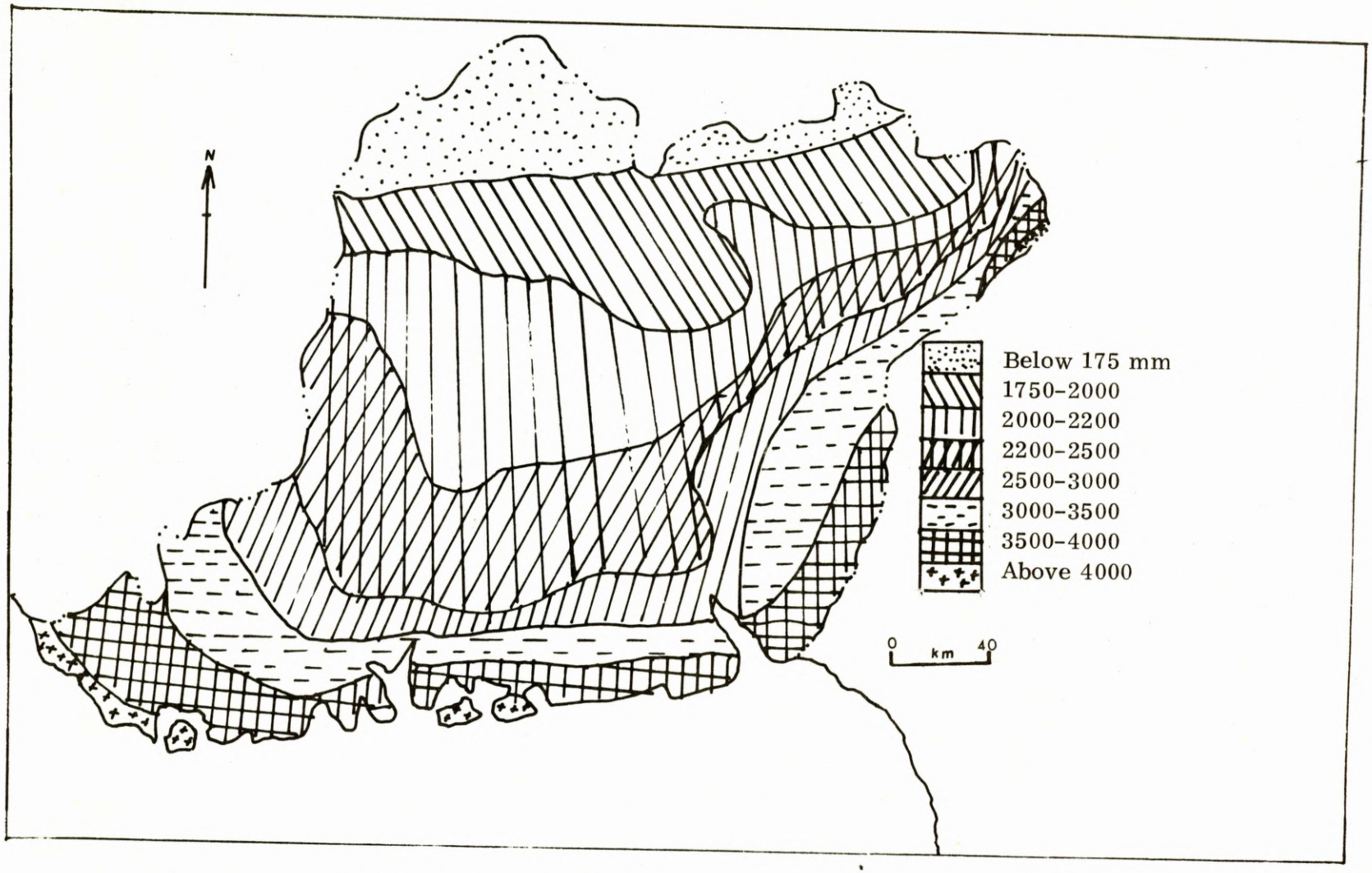



Figure II. 7 Eastern Nigeria: Mean Annual Rainfall

of rainfall causes much damage within a very short time through the severe erosion of the bare or partially bare soils (Ofomata 1977).

Another disadvantage of the seasonal pattern of rainfall is its concentration in a relatively short period of the year. It strongly influences the economic activities of the rural population. Thus the crop calendar is a direct reflection of the rainfall regime (Floyd 1969).

b) Temperature

Temperatures are uniformly high with very little seasonal variation. The high intensity of solar radiation throughout the year resulting from the altitudinal location of eastern Nigeria is said to be responsible for the high temperatures. Although mean annual temperatures are everywhere over 23.9°C they do not exceed 29.5°C while mean maximum temperatures do not exceed 32.3°C (Fig. II.8).

However the annual means are not as critical to man as the daily and seasonal march of temperatures. Diurnal thermal variations may well be greater than seasonal differences. The hottest months of the year are February and March while August is the coldest month.

Temperatures are high enough to permit year-round growth of plants and agricultural activities. A seasonal pattern of cropping is necessary due to lack of moisture and not the result of a temperature-induced dormant season. Moreover, where water is available through irrigation, and where the terrain and soils are favourable, year-round agriculture is feasible.

Elevation (Nsukka-Udi Plateau) and localized breezes and winds over the upland areas ameliorate the temperatures increasing the tendency for populations to settle in the watershed areas for defensive reasons.

c) Relative Humidity (R. H.)

Relative Humidity is one of the most variable of the climatic elements. Monthly and annual averages of Relative Humidity are high throughout the region and are generally higher in the vicinity of the coast and decrease inland. In addition to the high temperatures the high humidity makes the coastal area very enervating as a habitat but the effect of cool sea breeze has a moderating effect as well.

Relative humidity influences the reaction of the human body to air temperatures. It is also thought that the sudden changes over short periods of time also markedly affect the efficient functioning of organisms, but the exact nature and consequences of this stress on animals and plants are still little understood (Floyd 1969).

d) Climate and Man

Man in his natural environment gains heat through convection, radiation, and conduction. When at work his metabolic heat increases but this tendency is more so where air currents bring more heat to the body and especially where the ambient temperature is over 32°C.

Under high temperature food preservation is difficult without freezers and refrigeration. Moulds easily grow on items of clothing and food, making

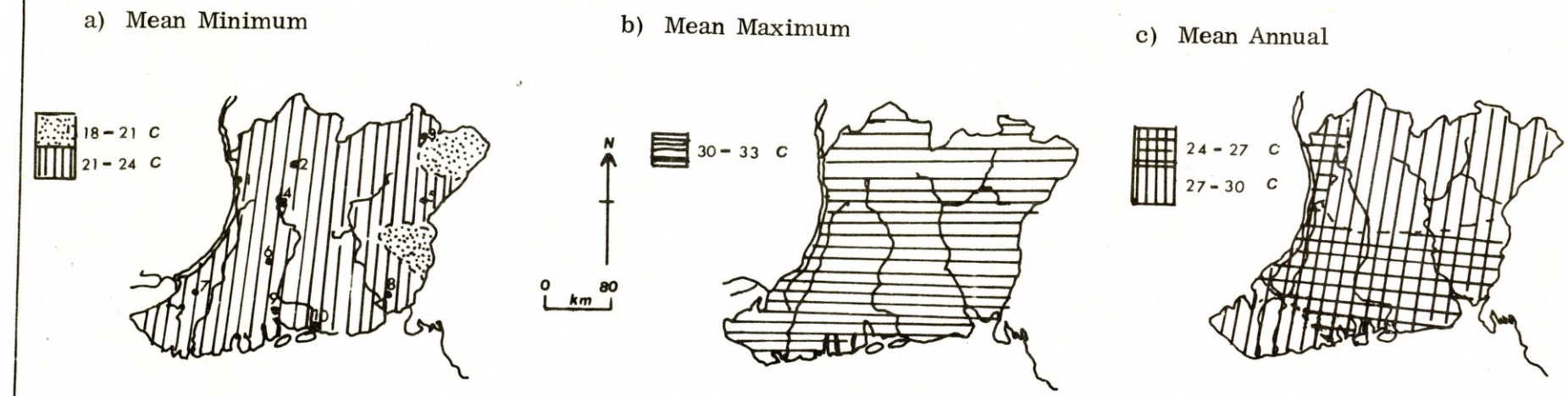



Figure II. 8 Eastern Nigeria: Mean Ranges of Temperature

way for optimum bacterial activity which results in rapid decay of perishables. These conditions have a limiting effect on the economic life in the area under study.

e) Climate, Soil and Agriculture

It is observed that the combination of high temperatures with abundant moisture favours rapid chemical rotting and the leaching of soil nutrients. Roots of some plants are unable to reach their food resources in such circumstances; the soils become acidic, that is, have pH values ranging from 4.5 to 6.9 (Bunting 1965). Soil analyses recorded for Okochiri have pH values of over 6.9.

Flooding results in gleying which creates anaerobic conditions which though rich in organic matter can only support plants likely to overcome waterlogging and lack of oxygen. This is the general situation in the delta.

Soil temperatures average between 27°C and 32°C. Darker soils with higher temperatures favour the cultivation of crops like cocoyam, plantains and bananas. Vegetated areas have lower daily and seasonal ranges of temperatures than bare or cultivated soils. Yam cultivation in areas of such high soil temperatures requires mulching to protect the shoots from withering from excessive heat.

Extreme variation in climate is the exception rather than the rule and though it is agreed that much of the variation in the mode of life in the area of study cannot be explained by climatic factors we need to realize that the ecological impact within the area may also be tremendous. Since longer dry seasons tend to favour grasses over arboreal species there is a tendency for savanna-woodland scrub, woodland scrub-forest vegetational borders to shift with the grassland expanding and hardly contracting. The state of affairs is heightened in the face of the intensive cultivation and less marked fluctuating climate. Professor Richards (1961) among other students of the interaction of soil, climate and vegetation has stressed the climatic factor while Keay and Onochie (1947) had shown that biotic factors played a major part in the savanna situation of African vegetation. The dynamics of these vegetational perturbations and their implications for human adaptation are reflected in the analysis in subsequent sections.

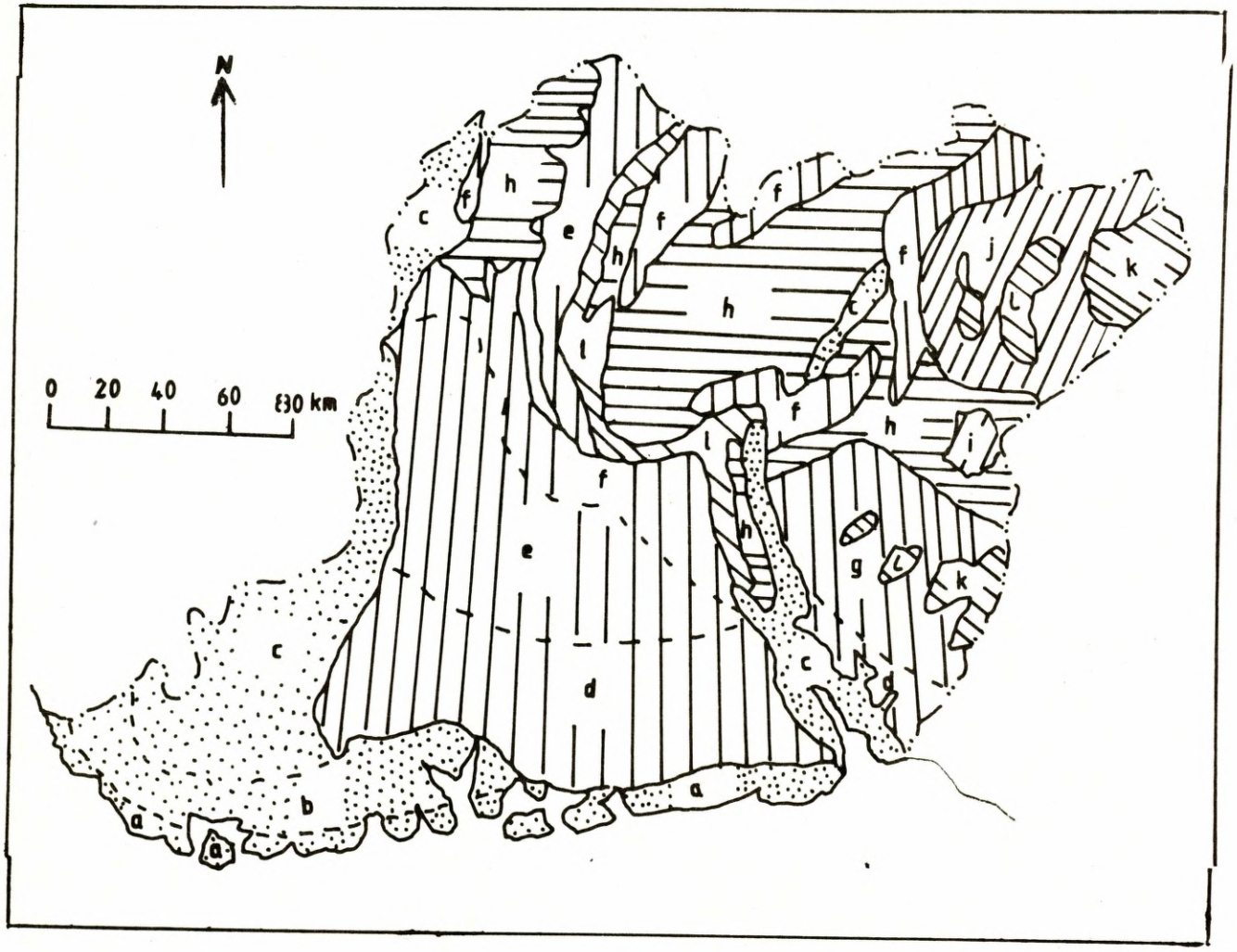
4. Soils

Soil characteristics and soil locations in eastern Nigeria are related to the present and past patterns of vegetation, agricultural land use, economic activities, rural settlement and demographic change.

Pedologists recognize five interacting basic environmental variables in soil formation—climate, biota, topography, parent material and time (McMillan 1976:17-19). While factors of topography and parent material are relatively constant and each is related to the interaction of the other four it is noted that the factors of biota and climate tend to oscillate most.

Soil studies in Africa range from those which treat the continent or one major area of it (D'Hose 1960; Ahn 1970) to those of specific parts of a major part or sub-region like those of Grove (1951), Carter (1958), Obihara (1961) and Jungerius (1964) which concern eastern Nigeria. The classification

FIG. II.9 Eastern Nigeria: Soils



LEGEND

Young Soils Derived from Recently Deposited Materials

- a Brownish yellow fine sandy soils derived from beach deposits
- b Dark grey mangrove soils
- c Pale brown loamy alluvial soils

Ferrallitic Soils

- d Deep porous brown soils derived from sandy deposits
- e Deep porous red soils derived from sandy deposits
- f Red and brown soils derived from sandstones and shales
- g Yellowish red gravelly and brown sandy soils derived from acid crystalline rocks

Hydromorphic Soils

- h Reddish brown gravelly and pale clayey soils derived from shales

Ferruginous Tropical Soils

- i Red clayey soils derived from basalts
- j Red gravelly and brown sandy soils derived from acid crystalline rocks

Lithosols

- k Shallow pale brown soils derived from acid crystalline rocks
- l Shallow brown soils derived from sandy shales

(Modified from Floyd, B. 1969)

of eastern Nigerian soils made by Jungerius (1964) is adopted here for its clarity, detail and regional approach.

Five major classes of soil are identified and differentiated on the basis of their morphology and degree of profile development. Each is further subdivided into mapping units according to characteristics of the substratum or the soil colour (Fig. II.7). A striking feature of the soil map is that it follows the trending pattern of the geology, landforms and climate.

a) The Lithosols

These shallow stony soils occur in the eastern highlands as shallow pale-brown soils derived from acid crystalline rocks, and on the steep slopes of Nsukka-Okigwe-Arochukwu escarpment as shallow brown soils derived from sandy shales. The latter soils are cultivated intensely by means of terraces described by Floyd as 'one of the most impressive systems of agriculture to be found within eastern Nigeria' (1969:103).

b) Juvenile Soils

These soils derived from recently deposited materials include the pale loamy alluvial soils of fresh water swamps and the brownish yellow fine sandy soils derived from beach deposits. Annual floods add fresh materials to these soils. The fresh water mangrove and Rafia swamp soils are potentially useful for cultivation as demonstrated in the Anambra Valley but drainage control is a hurdle to their exploitation.

The dark bluish grey mangrove soils and silty clay loams of the salt water and tidal mangrove (Rhizophora) swamps of the lower Niger delta are unfavourable to agriculture and even to human habitation.

The brownish yellow fine sandy soils with slight humus grey top soil derived from beach ridges are piled up by wave action all along the coast.

Thus the three ecological regions of the Niger delta have different and well marked soils which again support specific plant communities and activities. A disconcerting feature of the zone of the juvenile soils is the absence of drinkable water. The rocks are already saturated with ground water. Moreover the ingress of sea water contaminates the available fresh water while the sea water trapped within the soils is retained. The end result is that where boreholes produce potable ground water the invasion of brackish water eliminates their usefulness. This no doubt has its consequences on the occupation and settlement of the Niger delta in the past as well as the present.

c) Ferruginous Tropical Soils

Ferruginous soils are rich in free iron but have an appreciable mineral reserve with limited aluminium. The most valuable are the red clayey soils derived from basalts occurring around the Cross River over volcanic rocks. In the Obudu Plateau area which is sparsely peopled and largely under forest, red gravelly and brown sandy soils occur.

d) Ferrallitic Soils

These too are rich in free iron but possess a low mineral reserve and consequently a relatively lower fertility. These soils unfortunately cover

over 50% of the entire eastern Nigeria. They include yellowish red gravelly and brown sandy soils derived from acidic crystalline rocks. Obihara (1961) refers to those deep porous red soils derived from sandy deposits which cover the loose coastal sands as 'acid sands'.

In terms of agricultural potentiality they are called 'poor' though they produce yams, cassava, beans, other vegetables, maize, bananas and oil palm fruits. It is remarkable that these poor soils support some of the highest densities of rural population to be found in sub-Saharan Africa. Floyd (1969) suggests that these soils are able to support this concentration of population because they provide the most important water bearing bodies or aquifers in the area. Another thesis holds that the area was formerly very fertile, making such population density possible but that lengthy human occupation and the attendant intensive exploitation of the land has resulted in poor soils. This explanation sees the widespread forest clearance, bush burning, and other man-induced changes as the major factors in the impoverished soils of today. However one looks at it, the present situation appears to have resulted from the collaboration of a number of factors, some physical, some biological.

e) Hydromorphic Soils

These are pale coloured mineral soils whose morphology is influenced by seasonal waterlogging caused by the underlying impervious shales.

Large quantities of yams, cassava, maize and some legumes are produced and rice is also cultivated during the rainy season in depressions composed of loamy clay of the rain-fed inland swamps. In response to waterlogging, additional hemispherical mounds or heaps are usually constructed to raise the roots of plants above the saturation line as in Abakaliki or in the Anambra Valley. Settlement is also affected by waterlogging.

These good food-producing but sparsely populated sectors of eastern Nigeria contrast drastically with the poor food-producing densely populated sectors.

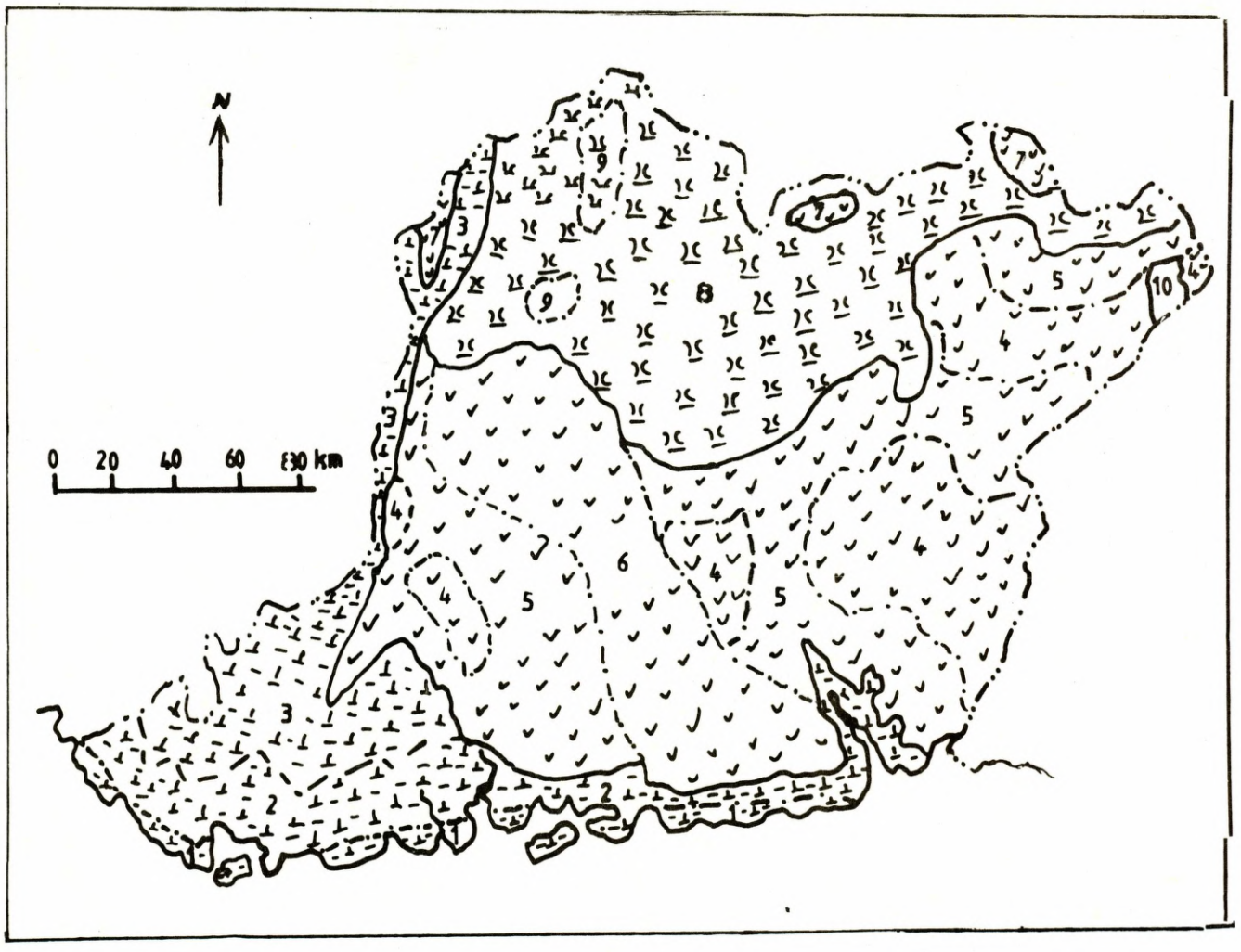
## 5. Vegetation

In any treatment of the relationship between prehistoric man and his environment, the composition and distribution of the vegetation is pivotal to understanding the culture process itself. Since subsistence strategies of human groups at a technological level comparable to those considered in this book are directly dependent on local plants and animal resources, it is essential that we have some understanding of the locality's past and present biota.

While the principal plant regions correspond to the locations of the physiographic and topographic areas previously described, the boundaries on a microscale are not quite identical. Plants are important in every ecosystem because they are responsible for the primary production of food and they also shape the habitation of other organisms.

Four major geographical factors acting in concert account for the natural vegetation: climatic (precipitation, relative humidity and temperatures), topographic, edaphic (soils and soil waters) and biotic (animal, man and

FIG. II.10 Eastern Nigeria: Vegetation



LEGEND

Mangrove and Coastal Vegetation

1. Sandy beach vegetation
2. Saltwater mangrove swamp forest
3. Freshwater swamp forests

Lowland Rainforest

4. Largely unmodified
5. Partially modified
6. Greatly modified
7. Sizeable relict outliers of rainforest

Derived Savanna

8. Woodland grassland
9. Open grassland

Montane Vegetation

10. Rainforest and grassland

(Adapted from Floyd 1969)

plants). It is observed that the climatic factors have been most influential on the vegetation cover of the area under study. In short the physiognomy of plant communities is in large measure a reflection of climatic differences. The mean annual rainfall and the duration and intensity of the dry season tend to determine whether the end-product vegetation would be forest or savanna.

The natural vegetation is also affected by such physical factors as the nature of the terrain—low-lying, water-logged ground, and the incidence of forest and grass fires. Man as a biotic factor transforms the vegetation through settlement, agricultural land use and other land management activities.

Variation of vegetational regimes is the rule, hence relict outliers of rainforest are found within the zone of the derived savanna and vice versa. This intermingling of communities of different ecological regions rules out sharp definition of boundaries between zones (Keay 1959:6).

Studies in the vegetation of eastern Nigeria follow the broad surveys of West Africa by Dalziel (1937) and Hutchinson and Dalziel (1954-58); the more particular patterns of Keay (1959) dealing with eastern Nigeria as a whole; the very specific micro-study patterns of Rosevear (1947) on mangroye forests, Adeyoju (1965) on forest resources, Otedoh (1974) on Raphia Palms, of Keay and Onochie (1947) on the savanna and recently Sowunmi (1975) on palynological studies of parts of the eastern Niger Delta.

The vegetation of eastern Nigeria has followed the climatic, edaphic and topographic trending patterns earlier noted. Four major vegetation zones are recognized for this study—mangrove and coastal vegetation, rainforest, derived savanna and montane vegetation. Within each major zone are microzones which equally require understanding for grasping the interplay of man and the environment exhibited in the economic and human settlement patterns (Fig. II. 10).

a) Mangrove and Coastal Vegetation

This zone covers the entire coastal zone of the Niger delta extending further north along the course of the river Niger into the Anambra Valley. It is subdivided into 3 sub-zones: (i) the zone of sandy beach ridges along the coast, composed predominantly of easy draining sand where coconuts, oil palms and tropical evergreens thrive (ii) the saltwater mangrove swamp, the morphology of which is subject to changes especially where it borders the fresh water swamp. This is caused by the variations in the discharge of the River Niger and its delta waterways in the wet and dry seasons. Mangrove swamp forest appears on the accumulations of deltaic muds and silts which predominate in the tidal creeks and around brackish lagoons. The red mangrove Rhizophora, up to 50 metres long and 3 metres in girth, is the commonest tree and the different species R. harrisonii and R. racemosa provide fishing communities with firewood, pit props, building poles as well as 'cutch', a substance for preserving nets (Floyd 1969:156); (iii) freshwater swamp vegetation: this is the low-lying area of brown and sandy loams at the crest of the levee and the more acidic more clayey soils on the slopes subject to seasonal flooding. It is subject to an irregular growth of many different trees, shrubs, lianas, swamp lilies and grasses. Many of the

trees are upheld by systems of adventitious curving and ramifying roots. Different species of palms and mahogany (Khaya ivorensis) are predominant, the former supplying palm wine, building materials and fibre, while the latter served the timber industry. Natural levees high enough to escape flooding provide settlement sites and cultivation grounds for cassava, yams and vegetables. More detailed analysis of the mangrove and coastal ecology can be found in Chapter IV.

b) Lowland Rainforest

The view is expressed that this zone may have extended further north in former times, but how far north is uncertain. Four major strata are recognized in the unmodified rainforest: the uppermost comprises a few tall smooth barked trees normally between 40-65 metres (e.g. the mahoganies and iroko); the second stratum consists of a great variety of trees 17 to 40 metres high; the third comprises many smaller trees up to 17 metres while the fourth is a ground level association of small single stemmed shrubs, herbs, mosses and lichens. Some writers (Keay 1959; Floyd 1969) recognize the 'oil palm bush' as a separate vegetation zone. In fact the oil palm (Elaeis guineensis) is found in most parts of eastern Nigeria and where it does occur in great concentration is a sub-zone of the rainforest but greatly modified. The Rainforest zone can be divided into three subzones—largely unmodified, partially modified, greatly modified. However, these tall palm trees (17-33 metres high) are cultivated and preserved for their poles, leaves, bark for ropes but more for their oil, nuts and palm wine. The origin and nature of the initial association between the oil palm and man are still obscure.

c) Derived Savanna

This vegetation zone is found in areas with less than 190 cm of mean annual rainfall. It is believed that what is today derived savanna was once secondary rainforest but reduced to open woodland of fire resistant scrubby trees, climber and shrubs as a result of soil impoverishment and deterioration of vegetational cover arising from persistent slash-and-burn, and shortened bush fallow (Keay and Onochie 1947; Keay 1949; Richards 1961). The combination of grasses and trees varies according to the intensity of human settlement and land use, soils, terrain and drainage. Grasses and scattered trees occupy the porous deep-red and reddish brown sandy and gravelly soils of the Nsukka-Udi Plateau area. On the richer loamy alluvial soils of the Anambra Basin tall Daniella and fan palms are dominant.

d) Montane Vegetation

This occurs only in the Obudu Plateau and the highlands to the east. While montane grasses of knee-height occupy altitudes over 1670 metres the slopes are occupied by rain and mist forests.

6. Fauna

The fauna of a biotic community is a reflection of the total environment, especially the vegetation cover. According to ecological principles, in transitional areas (between two or more diverse communities e.g. between forest and grassland) there is a tendency for increased variety and density of species. This is because of the "edge effect" (Odum 1971:157) operating in

ecotones. In the study area this principle would probably have operated and might still be in operation but its application in this study is beset with problems arising from the fact that sharp vegetational boundaries are difficult to establish with any precision; past faunal densities are difficult to calculate in an area where no such records exist and records of present day fauna are erratic, unsystematic and such information is for tourist and general reader consumption. However, ethnographic and field reports suggest that there were species adapted to both the forest and grassland biomes as well as a number of species preferring the ecotone or edge community (Nzewunwa 1979: 420-423).

The faunal assemblage includes those common to tropical Africa (Bannermann n.d., White 1965). In the rainforest, tree and ground dwelling animals include different species of monkeys, chimpanzees, antelopes, leopards and elephants. Rodents include rats and squirrels. There are also such reptiles as geckoes, chameleons, lizards, fruit bats and different snakes. Birds of the forest include the crested guinea fowls, hawks, ground horn-bills, green fruit pigeons, the grey parrot and wood owls (Helsop 1935; Nelson et al. 1972).

In the derived savannas are lions, cheetahs, hyenas jackals and several other predators as well as elephants, buffaloes and antelopes.

Fauna of the mangrove creeks and lagoons include amphibious vertebrates like toads, frogs, river turtles, manatee, crocodiles, hippopotamus, water snakes, other marine and lagoon animals. Sand crabs, ghost crabs, hermit crabs and hairy mangrove crabs are also found.

Shore birds which depend on sea animals for their food are generally of the type with long legs for paddling in the edge of the waves and long bills for probing the sand and mud for their prey, for example sand pipers and whimbrels.

Numerous fish species inhabit the rivers, lagoon and coastal and offshore salt water. They include catfish, tilapia, carp, sea perch, snappers, prawns, shrimps, sardines (sardinella), mackerel, bream, threadfins. Sharks occur in the saltwater zone and crayfish are numerous in the Niger Delta.

Hunting, agricultural land use and human settlement have resulted in the depletion of the larger animal species. Many of the mentioned animal species are now very scarce—in some cases extinct. The trend is blamed on increased inefficient exploitation as a result of animal protein shortage. In a paper presented to the West African Archaeological Association, the present writer, using ethnographic sources, traced the distribution of certain animal food resources in eastern Nigeria, the exploitation strategies of the human group, and the implications these could have for archaeological research (Nzewunwa 1976). The place of fauna in the subsistence economies of eastern Nigeria is exploited in later chapters.

## 7. Present Population and its Economic Activities

Broadly speaking, economic activities fall into two categories: the traditional one of subsistence agriculture, and the money-oriented industries. Our concern here will be with the traditional economy. This follows the geographical

zones connected with relief and drainage, soils and vegetation, weather and climate. Broadly, the traditional economies divide into two: the terrestrial and the riverine/marine. In some areas they are operated side by side. The patterns of eastern Niger Delta subsistence are fully explained in Chapter VII.

a) Terrestrial

Terrestrial economy is dependent on the exploitation of the land. The major activity is the cultivation of various crops on a short bush-fallow basis. In their ethnographic studies of eastern Nigeria, Forde and Jones (1950) recognized four agricultural zones on the basis of cultivation intensity. It is worth adding that their classification implies that economic activities are to a large extent regulated by the environment.

Subsistence farming is based on yam cultivation and, except in Owerri, is a man's activity. Cassava has assumed much importance of late and in some parts has replaced or taken over much of the time, land and labour formerly monopolized by yams (Johnston 1958) but the yam has not lost its position as the preferred item in the diet (Coursey 1967). Subsidiary crops include cocoyams, maize, peppers, beans, okro and gourds.

Throughout eastern Nigeria palms are exploited for their oil and kernels, both of which were locally consumed, but a large quantity of which now feed the export market. Palm wine (local beer) from oil and raffia palms is a famous alcoholic drink among the people.

In some parts agriculture employs over 70% of the total labour force. The agricultural system—the rotation bush fallow system—has been described in various ways by Concklin (1961), Pelzer (1957), Uzozie (1975), Morgan (1955), Harris (1969, 1972, 1973). The number of years of fallow varies from area to area but decreases with increasing population. Around houses permanent cultivation goes on in what is known as compound lands or compound gardens.

Food crop husbandry dominates to the extent that animals hardly come into the picture. 'Though an average family unit keeps ten to fifteen birds and two to six goats (mainly stall-fed), their contribution to the food economy and share of the agricultural land and labour inputs are comparatively small' (Uzozie 1975:105). However, certain groups—Oguta and Umuahia-breed dwarf short-horn cattle, Bos brachyceros, but this breed has not been studied in detail though available records suggest it has been long established locally (Colonial Office 1957; Hill 1957; Wrigley 1972).

b) Riverine/Marine

In most inland parts fishing is of little importance except on the river banks. On the other hand, many people in the Niger Delta live by fishing while a few others obtain salt from sea water or make mangrove salt. A little of the fishing is done by women and children but the bulk is a man's activity—the fisherman is either sedentary or migratory, depending on the habits of the fish in the area. This theme is discussed fully in the chapter on economic systems (Chapter VII).

Hunting is practised everywhere either individually or in organized groups, but intensive hunting and the reduction of vegetation cover have brought about a great scarcity of game.

Collecting and gathering are activities in practice in the whole area though in some more intensively than others. These economic practices supplement the grown food sources in the diet of the people. Non-garden foods are procured from both the forest and grasslands but more in the former. These include tubers, edible ferns, herbs, leaves, mushrooms and tree nuts. Larvae of certain beetles and snails are collected from trees and eaten after roasting, frying or boiling.

c) Technology

Technological activities are specialized and tend to be in the hands of special inheriting groups. The two most important are metal working which was long known among the Awka, Nkwerre, Abriba, the first two specializing in iron-smithing and the last in copper- and brass-smithing, and potting, a woman's art. Potting is practised among all different groups where the necessary raw materials are available—Nsukka, Agbaja, Anambra Valley, Ikwerre, Ogu, Ilelema and the Ogoni. Field investigations show that potteries are widespread and each has its catchment area. The technology and material culture are further discussed in Chapters VIII and IX.

8. Conclusions

It can therefore be accepted that the Niger Delta has always offered a rich and varied environment for human groups. It must always have varied specialization and a variety of livelihoods and, it may be suggested, would have favoured the development of exchange networks. The effect of this upon the archaeology is discussed in Chapter III.

# CHAPTER III

# THEORETICAL CONSIDERATIONS AND THEIR APPLICATION TO THE NIGER DELTA

## INTRODUCTION

This chapter aims at surveying some of the theoretical bases of human interaction with the natural environment with special reference to the delta. Because man is first and foremost related to the natural environment for a means of livelihood, greater emphasis has been placed in this chapter on the concepts that relate to the subsistence economic aspects of human behaviour. The four concepts considered here and which were utilized to collect, analyse and interpret the data are: 1) the concept of resources, 2) the concept of territories, 3) the concept of energy use and 4) the concept of nutrition.

### 1. The Concept of Resources

Man's resources result from the interaction between him and the rest of the physical world. Resources therefore are those various elements of man's environment to which he assigns utility. The choice and importance of these environmental elements depend on the size and distribution of human communities, their needs, values and skills.

#### a) Resource Availability

The availability of resources at any time is the result of the interactions among the nature and size of man's requirements, the physical occurrence of the resource and the means of producing it (Chapman 1969:33). Estimates of available resources involve relations between the physical and human variables that are not only complex but also vary in time and place.

Studies in resources (Lovejoy and Homan 1965; Chapman 1969) differentiate two aspects of resources—the total stock or resource base, and the resource. By total stock is meant the total of all components of the environment that would be resources if they could be extracted from it. This is the ideal situation.

Assessment of the total stock is difficult if not impossible in prehistoric economic studies. Archaeological sites are subject to environmental and other ecological modifications and may give a biased idea of the total resource utilized by their inhabitants as differential preservation and partial recovery further complicate the archaeologist's assessment potential.

On the other hand, we understand by resource, that proportion of the total stock that man can make available under different technological and economic conditions (Chapman 1969:33). In this case the level of technology will set limits within which different economic and social variables can

determine how much of the total stock can be exploited. But every human group in some way underexploits its environment because socio-cultural factors determine what is useful or valuable within the available range of resources. Three important factors which affect the relation between the requirements for resources and their availability are time, space and technology.

i). Space

The relevant aspects of space in resource studies revolve around the quantity of them in a unit area, location, distribution and interaction of resources. A resource may be located in only one area or in different locations separated by distance. In other words resources are more or less fixed in their locations, although they have a distribution in space with continuities and discontinuities.

Resources also interact in the sense that a number of different resources may be located within a given unit area or separated over wider distances. Another level of interaction between resources is the application of technology to their exploitation—thus bringing a number of hitherto separated resources together. It can safely be assumed that in the past interaction across great distances was limited by the absence, or prohibitive cost, of transportation.

Among societies with a low level of technology, and even in industrialized societies, economies exhibit an areal differentiation. In the study of man-resource relationships in the eastern Niger delta the immediate environment is recognized as the most critical. Resource space therefore is first conceived in micro-environmental terms though zonal and regional patterns are also identified (see Chapters IV and VII).

Space also affects resource diversity and stability of systems. A resource in a restricted space would be exposed to extensive exploitation if it was preferred by a human population with few options. Conversely, a larger area with a variety of potential resources and the opportunities for spatial substitution and dispersion would tend to be more stable even if exposed to extensive exploitation.

These characteristics of space which affect resource availability and distribution do to some degree also affect human behaviour in the choice of location for habitation sites and in the preference of certain resources. This is demonstrated by the distribution of some coastal sites (Chapters IV and V).

ii) Technology

The evolution of those instruments produced by man but not belonging to his body is a fundamental factor in the interaction between man and nature. These instruments enable man to discover, produce, process and use materials of his environment. As a result of man's addiction to these instruments the range of available technology changes over time.

Technological advancement can thus help to exploit new resources from the environment, or to increase the rate at which the resource is acquired as well as make for greater efficiency in resource exploitation (Chapman 1969). However, different resources require different kinds of technology

for viable exploitation. Thus while iron implements would prove an advantage to farming communities, boats would also have been more useful to fishing communities, while communities that live on filtering shrimps and crabs in tidal creeks would place greater value on basketry.

iii) Time

Time dimensions are important for resource studies because by their very nature resources are expendable. One adverse impact of technology on resources is the depletion of the resource base especially where exploitation is intensive and haphazard, and the biological factors do not compensate for losses through exploitation over time.

Another aspect of time dimension applied to resources exploitation is in the reduction or removal of space barriers between the human group and the resource. This theme is discussed below as the 'Time-Distance Factor'.

b) Resource Exploitation

The study of man's past economy through archaeology becomes all the more worthwhile because almost every facet of man's life is in some way tied up with his economy (Clark, G. D. 1972; Hole and Heizer 1973). The concept of resource exploitation, otherwise called economy, involves the components of acquiring, distributing and utilizing in such a way as to ensure the survival of the given human group. Economy is therefore multi-faceted embracing not only the technological, environmental, but also the social sphere of man's life (see Fig. III. 1).

Archaeological studies with a bias for economy are mostly concerned with food procurement otherwise called subsistence economy.

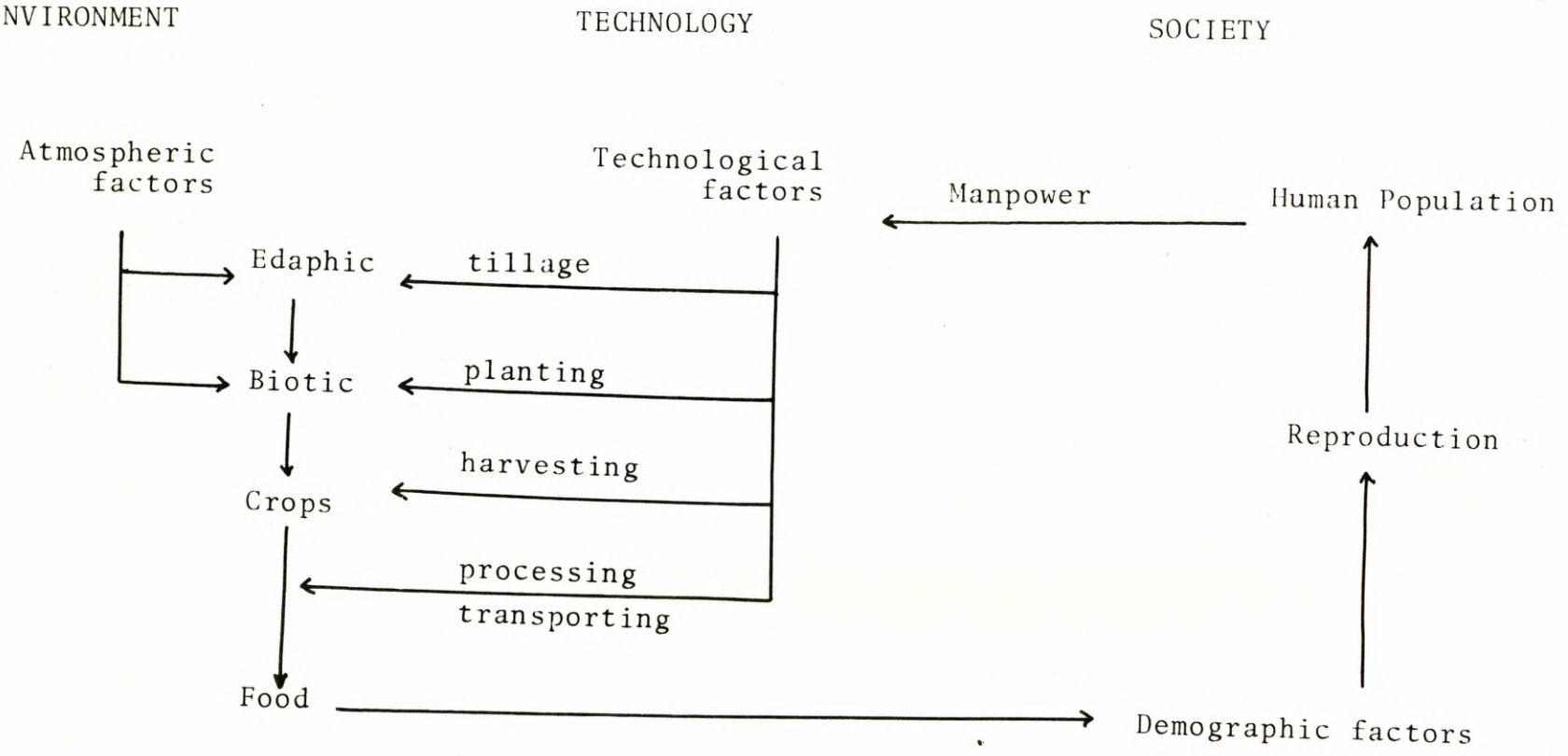
c) Economies

Following ethnographic studies among present hunter-gatherers (Lee 1968) and farming communities, prehistoric peoples are said to be mobile, sedentary or a combination of the two (mobile-cum-sedentary) (Higgs et al. 1967; Vita-Finzi and Higgs 1970; Higgs and Vita-Finzi 1972). Their economies are more or less differentiated by the degree of movement or sedentarism involved in their food procurement patterns, the nature of the resource they exploit, the technology they utilize and to a certain extent the level of social organization and population size of the group.

Economies of mobile groups involve more movement in a given year from one resource centre to another. Movement or the tendency to move would be expected to be occasioned by reducing resource bases but there also appears to be an acquired 'mobile instinct'. However the need to move insures that other resources are available to the group. Groups with mobile economies possess very low technology, are in bands of very few people and would be expected to exploit a wider geographical area in any year than would their sedentary counterparts. Hunter-gatherers and pastoralists belong to this classification and so do fishing groups that depend entirely on following shoals from ground to ground.

Mobile-cum-sedentary groups exploit resources separated in space and seasonal in character. By combining mobile and sedentary characteristics these people achieve equilibrium with particular environments.

Figure III.1 Simplified Schematic Representation of Interaction between the Environment, Technology, and Society in a Subsistence Farming Economy



Sedentary societies would by definition stay in one location all the year round or exploit most of their resources from a given location. Farming communities are good examples of societies that have sedentary economies.

In eastern Nigeria the predominant economy today is sedentary, although in the delta, fishing communities do exercise a good degree of mobility especially in search of migrating fish there is a particular home base to which they return. The mobility is also limited and the practice is now more in response to a cash economy than to subsistence needs. At the same time some communities on the Anambra-Niger Valley appear to combine some fishing with cultivation. The same case is also true of freshwater communities in Niger delta. This theme is discussed in Chapter VII. In pre-farming times there must have been more mobile hunting-gathering/fishing groups in the delta than today.

## 2. The Concept of Territories

### a) The Territory

Studies among mobile societies, !Kung Bushmen (Lee 1968), the Hadza (Woodburn 1968) and others concerned with human and animal behaviour (Steward 1936; Burt 1943; Ardrey 1967) show that human groups exhibit some degree of territoriality in their economic behaviour. This is in keeping with the fact that resources are distributed in space and human groups have to exploit them from given locations or sets of locations.

As an operational concept devised for collecting, analyzing and interpreting data in archaeological research a territory has been defined as that area habitually exploitable by a human group (Jarman et al. 1972). Two types of territories are identified in current archaeological usage—the annual territory and the site territory.

The annual territory is that area covered by a human group in the course of a year in its exploitation strategies and this area may comprise a number of complementary site territories. The site territory on the other hand is the total area that a human group exploits from a given site. However the nature of an economy, the means of transportation available to a human group, demographic and the topographic factors affect territories exploited from any site.

One assumption in territorial analysis is that the territories are exploited from sites which are home bases. A second assumption is that the critical variable in territorial exploitations is the distance factor.

### b) Sites

#### i) The Home Base

The home base is a site from which human beings radiate out to exploit a site territory and to which they return with the harvest. The radiations, as the present study discovers, need not necessarily be daily or even occupy the whole day (see Chapter VII: Home Bases).

The home base has obvious socio-economic advantages. It is a pool for surplus, a centre for communal sharing and therefore for spreading various

food items of varying nutritional values among members of the group. It is also a welfare centre for the aged, the sick and the young. This complex set of activities has been termed 'the home base exploitation' (Bailey 1975). Home bases have in more cases than not come to equate preferred sites (Higgs 1975).

The archaeological implication of home bases as preferred sites is that with time there is substantial accumulation of domestic refuse as in shell middens. The volume of such refuse accumulation is a function of the size of the group, the distribution and exploitation of the resources within the territory, the value placed on the resource and also the length of time in the utilization of the site as a home base. These variables, which to a large extent are quantifiable, prove very helpful in midden analysis (Chapter VI).

Figures III. 2 and III. 3 are hypothetical home bases which approximate to home bases found in actual delta field situations. Another situation is the combination of a number of home bases within an annual territory. This situation, called the home base cluster, is presented in Figure III. 4 and encompasses different economies.

ii) Transitory/Transit Sites

Home bases do not account for all the refuse that results from human activities. In the course of his annual exploitation strategies, man uses other sites for short intervals to exploit such resources that are not worth taking back to the home base or that his transportation facilities may not cater for. These sites where these activities of short duration take place may be transit or transitory sites and they may be a rest place where he consumes fruit or eats some shell fish raw. Those farm hearths over which man roasts yams or beetles or wild animals are also transit sites because they are more of rest places.

The archaeological implication of transitory sites is that they are not as large as the home base sites. This is in part due to the fact that they are occupied for a short period and the level of activity within them does not permit the accumulation of large debris. However, it is at times difficult to tell transitory sites from most home bases in shell midden accumulations as Bailey (1975) points out. In the Niger delta transitory sites would be expected to occur at different points along shores during shellfish exploitation. The same situation would also be true of farm sites. Because transitory sites leave few, if any, traces in the archaeological context they are likely to be ignored. But a confident analysis of home bases requires that a margin of allowance be made for resources exploited at transitory sites. Only in this way can adequate account be made of the 'unknown factor' in site analysis.

c) Distance-Time Factor

A viable economy entails that among other things a resource must be accessible in such a way that in the process of its acquisition the ratio of energy invested, is at worst equal to the energy it contributes in the upkeep of the body process. As earlier stated resources are located in space normally at a distance from the human group. A critical factor in territorial analysis is therefore the distance.

Figure III.2 The Ideal Home Base (usually for sedentary groups)

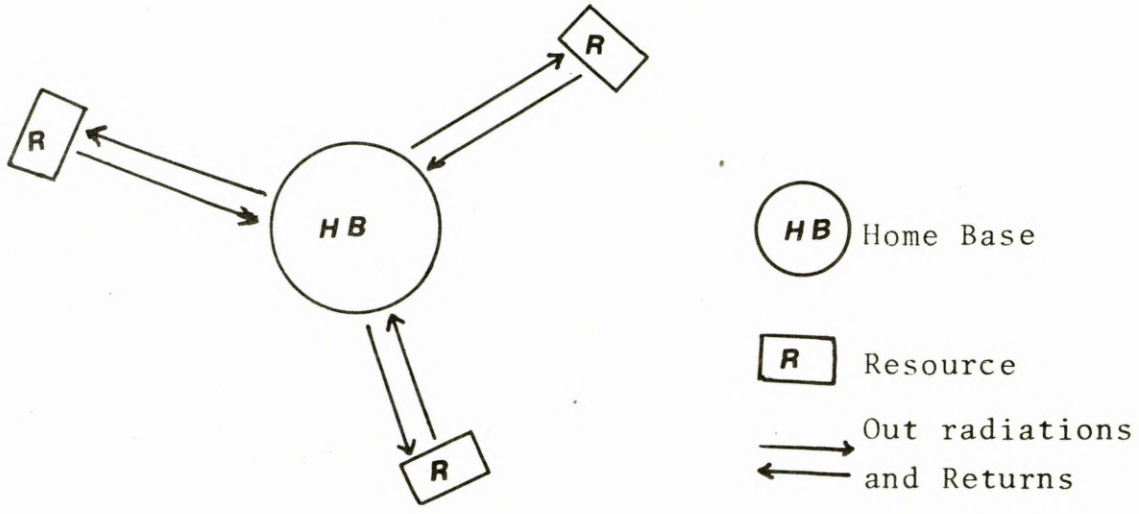



Figure III.3 Home Base as Preferred Site (for mobile groups)

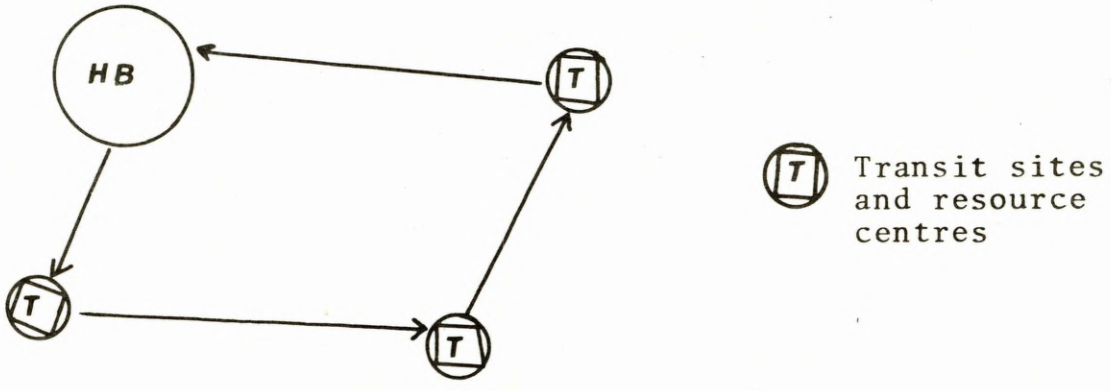
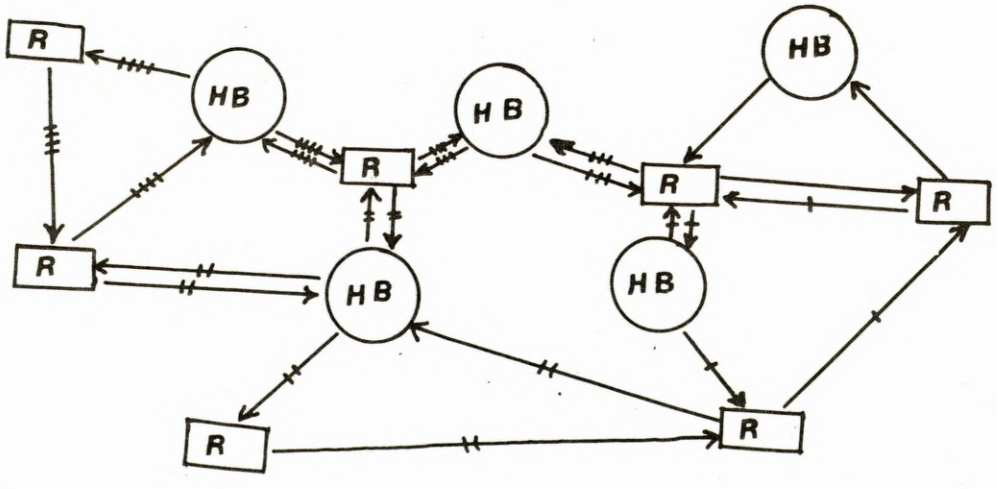



Figure III.4 The Home Base Cluster (A number of home bases in annual exploitation cycle: for mobile or mobile-cum-sedentary groups)



Lee (1968) shows that within a day's exploitation of their territory from their camp the Kung hunter-gatherers reach a threshold at a distance of about 10 km beyond which further exploitation is uneconomic. Chisholm's studies (1968) among subsistence farming groups show that diminishing returns set in at a distance of 1 km from the home base and are "oppressive and seriously detrimental" at about 3-4 km.

These studies have helped in shaping archaeological thought and influencing similar researches in archaeology. Independent field studies using the site catchment model (Higgs 1972, 1975) suggest that distances of 10 km and 5 km are thresholds for mobile and sedentary groups of people respectively.

To operationalize the concept the critical variable distance is difficult in territorial analysis because distance given in distance units is not a good measure for this purpose. Although 5 km distance in open country is equal to a distance of 5 km in the swamp and also to 5 km in a hilly country in distance units, the time taken to cover a distance of 5 km in the three environmental situations is bound to vary markedly. Because the time units are operationally more convenient, the variable distance is usually expressed in terms of distance covered in a certain time.

Thus expressed in units of time, a walking distance of 10 km for mobile groups approximates to 2 hours while a 5 km distance is assigned a 1 hour walking time for sedentary peoples. Economies that employ transportation facilities like fishing and shellfish collecting which utilize boats and dugouts have different time schedules for these activities: field measurements in the Niger delta show that a 5 km distance within tidal creeks took approximately 30 minutes ($\frac{1}{2}$hour) for a handpaddled dugout and 20 minutes (1/3 hour) for a Yamaha engine powered dugout with a capacity for over 10 people, and about 15 minutes (1/4 hour) for a Yamaha engine powered factory-made light river craft with a capacity for only four people. Again it need be borne in mind that the tides favour faster propulsion of the river craft and adverse weather and turbulent waves may retard progress. In the three situations the distance factor will first affect the handpaddled dugout and very minimally the engine powered river crafts. This is the direct impact of technology on subsistence economic patterns.

d) Site Catchment

The elements that constitute the activity or series of activities represented in an archaeological site have been brought together from a definable area called 'the site catchment' (Vita-Finzi and Higgs 1970). An assumption of the site catchment model emphasizes an ecotone boundary by stating that 'sites are commonly situated at the junction of different habitats the integration of whose resources results in a viable economy' (Higgs and Vita-Finzi 1972:28). The study of the relationship between technology and the natural resources within catchments of sites may be termed the site catchment analysis (Vita-Finzi and Higgs 1970:5).

The principle of site catchment analysis is a model of spatial behaviour concerned with the nature of human decision making. Like most location theory it therefore assumes that spatial structure is based on the principles of minimisation, maximisation or optimisation of certain variables or sets

of variables especially energy, distance and space. Johnson (1977) has observed that the strength of minimisation, maximisation or optimisation models resides in their ability to generate expected behaviour patterns as Jochim (1976) has demonstrated on studies with hunter-gatherers.

The assumption that sites are located with the major intention of resource exploitation around the sites does not necessarily always hold true. As indicated in Chapter IV and corroborated by other studies (Udo 1963a, 1963b) economic incentives, while being strong, may be subordinate to other factors—socio-cultural and historical in nature (Dalton 1961; Joy 1967). These factors need be integrated in explanations that have hitherto relied solely on economic factors that in the long run may have played little or no part in the location of sites.

The model also assumes that distance is a critical factor but it may equally not be decisive. Different human groups have different perceptions of time and distance and in the long run it is their perceptions that are decisive. It is essential that human groups who are a continuity of the past groups whose fossilized action is being studied be understood before generalisations about their behaviour are made.

A number of studies using the site catchment analysis model (see Higgs 1972, 1975) have tended to equate the site catchment with the site territory and thus have expressed the catchment in terms of a predictable radius from a site. In practice this hardly applies. A number of opportunities open to a site may lie beyond the site catchment or even the site territory. Results from other economic activities may account for this discrepancy. Long distance trade or other exchange systems may explain the presence of certain objects in a site though the raw material or the basic resource lies well outside the calculated site catchment. This further means that site catchments are more than regular circles and semi-circles which describe the hypothetical thresholds set by the site-distance factor and energy returns. If nothing else, site catchments as observed in delta field studies are irregular (see Chapter VII).

In its original form, site catchment analysis was devised for assessing agricultural economies relying on animals and plants brought into close association to man. In considering the immediate environment the model had relied solely on the relationship between sites and the ecology—soil and land classification. To assume that no major changes had taken place within the environment over many thousands of years is to some extent dangerous. Such an assumption has been made in this study because of the very short time scale involved—a few thousand years.

The advantage of site catchment analysis is that it is an empirical model on which data can be collected, and given the modifications noted above it proved useful as an operational model not only in subsistence economic theory but also in the analysis of the cultural phenomena observed in archaeological sites (Chapters VII-IX). The caution need be sounded that most models of locational behaviour are unverifiable because their underlying assumptions are untestable. But as Johnson (1977) says ("utility and testability are not necessarily coterminous" (1977:501).

## 3. The Concept of Energy Use

If optimisation as an economic incentive is not the major determinant of human behaviour, optimisation appears to be a crucial determinant in energy use. Energy use involves an input/output analysis the result of which justifies the investment in one activity as against another or assesses efficiency on the assumption that within the range of alternatives human groups would prefer the high-yield, low-cost activity to one of low-yield high-cost.

The concept of energy use is the basis of evaluating the later prehistoric economies in eastern Niger delta (Chapters VI and VII). The contribution of shellfood as the evidence from shell middens shows is compared to the contribution from other food resources like the root crops and the contribution from other animal resources procured in hunting practices. These considerations are based on yields of the given resource per unit area of space, on energy budgets and some nutritional factors.

### a) Demographic Models

A major problem in the study of the interaction of the environment, resources and human groups is the lack of viable models with some common denominators to which these variables can be compared or related in some type of equation or quantification. Some studies in demography have employed population, area, and carrying capacity models with varying success.

#### i) Population Density

The use of population density—the number of people per square unit of land—meets problems when the figures are used to compare or calculate energy use. This is especially so because humans are essentially individuals with their individual energy production and energy consumption capacities. The vagaries of age and sex differences make this the more obvious.

However, a major contribution to the efforts in this field is Sahlins' (1971) analysis of household economy for which he adjusted consumption figures among members of the household such that an adult male counted as 1.0 units, women 0.8 consumption units and children 0.5 consumption units. It is not unlikely that energy production will follow the order of consumption.

#### ii) Land Area

Different human groups use different sorts of lands in different ways and with different intensity (Heider 1972). The study of land use patterns in eastern Niger delta with subsistence based economies suggests that each type of land is essential whether it is under crops (under short or long fallow); forest; swamp; marsh or seasonal flooding. The problem therefore is one of what quantities to assign to each category of land in assessing its contribution to the population's upkeep. Even when land area is scaled or delimited as recommended in the guide to field methods in Site Catchment Analysis (Higgs 1975:223-234) the different categories still elude quantification.

However, using data from various sources Johnston (1958) was able to calculate the average yield of different staple crops in West Africa per hectare in terms of calorie yield (see Table III. 1). The use of these figures requires some degree of caution but they serve to compare the relative yield of the different staple crops that are the mainstay of the eastern Niger delta.

Table III. 1 Approximation of Staple Food Crop Yields, Calorie Values and Index of Calorie Yield per hectare, West Africa

| Crop | Approx. yield (metric tons/hect.) | Growth period (months) | Calories per 100 grams | Index of calorie yield per hect. | Areas relative | Production relative |
|---|---|---|---|---|---|---|
| Southern Belt | | | | | | |
| Manioc | 8.0 | 7-24 | 109 | 421 | 19 | 80 |
| Yam | 6.0 | 7-12 | 90 | 261 | 18 | 47 |
| Cocoyam | 3.0 | 6-18 | 86 | 125 | 5 | 6 |
| Sweet potatoes | 8.0 | 8-18 | 75 | 290 | 3 | 9 |
| Northern Belt | | | | | | |
| Millet-sorghum | 0.6 | 2-6 | 345 | 100 | 100 | 100 |
| Maize | 0.8 | 2-5 | 360 | 122 | 21 | 26 |
| Rice | 0.7 | 2-6 | 359 | 121 | 19 | 23 |

(Data adjusted from Johnston 1958, Table 6, p. 126)

iii) Carrying Capacity

The concept of carrying capacity also relates population to resources by suggesting that 'at some point the population will reach a size where the resource base will start to deteriorate' (Heider 1972:218). Used widely in the biological sciences (Slobodkin et al. 1967) and geography (Allan 1949, 1965; Street 1969), the concept is finding some acceptance among anthropologists and archaeologists (Shawcross 1970). Of late Zubrow (1971, 1972, 1975) has operationalized the concept in very illuminating, if complicated, prehistoric studies.

Carrying capacity has been defined as 'the maximum size of a population which can be maintained indefinitely within an area' (Zubrow 1975:15). A simple if rough estimate of the human carrying capacity requires a knowledge of the nature of the soil, data on the proportion of cultivable and uncultivated land, the time interval required for the soil to regain fertility after cropping and finally the acreage of land required per head of population under the technology in use. (Allan 1965.) Other complex sets of data categories, observations, assumptions and variables necessary for the calculation of carrying capacity make its application a cumbersome exercise. Street (1969) has challenged the concepts because they have not conceded the very factors that constitute soil degradation before assuming that more intensive use will result in further degradation.

In the present study area most usual sources in prehistoric and even in historic demography such as documents, quantitative data and settlement sites and patterns are lacking, and where available they are not only fragmentary and therefore incomplete, but also ambiguous. An approach based entirely on carrying capacity is less profitable and has not been pursued. Sherratt (1972:489) has observed that calculations based on carrying capacity are a 'dangerous procedure' and has advocated 'a detailed reconstruction of prehistoric economies based on evidence of food remains, technology and site locations'; and these have been used in this study.

b) Energy Budgets

Using thermodynamic models which state that energy may be transformed from one form to another but never created or destroyed, Lawton (1973) was able to transform the energy costs and gains of food procurement activities into sets of mathematical formulae making them quantifiable.

For most of life, animal and plant, energy means food. Man needs a continuous input of energy in the form of food to maintain and use the human body. The utilisation and subsequent transformation of the energy can be stated as

$$A = C - F$$

where A is that part of the food energy that is taken into the body (absorbed)

C is the food energy consumed (eaten per unit time by an individual)

F is that part of the food energy that is not assimilated and leaves the body as faeces.

But because energy (K) is expended in the process of acquiring the food energy, Lawton states that for the individual to survive, the ratio of food energy absorbed (A), divided by energy expended during its collection (K), must be at least equal to 1. Even this is dangerous because more than that quantity is required to ensure that body work processes are mobilized. Hence it is further suggested (Lawton 1973:61) that the minimum requirements for a viable feeding strategy are that the ratio

$$\frac{\text{food energy collected or consumed (C)}}{\text{energy expended during its collection (K)}}$$

should not be less than 2. It is this second ratio of 'energy gained to energy expended' that is of major interest to the present study.

Table III. 2 illustrates the summarized energy costs and gains of food collecting for a simple human society—the Lamotrek Atoll in the Pacific. The Table includes the major activities from which food may be procured and on which energy may be spent. As is quite clear the ratio of energy gained to energy expended is high to justify the activities and to ensure that not only is the body work process fully mobilized there is also some surplus stored for body use in later processes. The main processes on which energy is expended are set out in Table III. 3

Table III. 2 Energy Costs and Gains in Food Procurement Activities of the Lamotrek Atoll in the Pacific

| Gains and expenditures | k cal $day^{-1}$ |
|---|---|
| Food eaten by population | $0.59 \times 10^6$ |
| Work done in | |
| Tree harvesting: coconuts and breadfruit | $0.007 \times 10^6$ |
| Farming: pigs and taro | $0.017 \times 10^6$ |
| Fishing | $0.008 \times 10^6$ |
| Minimum energy expended | $0.032 \times 10^6$ |

$$\frac{\text{Energy gained}}{\text{Energy expended}} \quad \frac{0.59 \times 10^6}{0.032 \times 10^6} = 18.4$$

Adapted from Lawton (1973:67) based on data from Odum 1971.

Table III. 3 Main Processes on which Man Expends Energy in Food Procurement

| Activity | Level of Economy | Example |
|---|---|---|
| Maintaining food supply | Agriculture | Crop protection<br>Animal husbandry<br>Cultivation |
| Locating food supply | Hunting/Gathering | Advance party forays |
| Gathering and catching food | Farming | Harvesting |
| | Hunting/Gathering/ Fishing | Chasing, overcoming<br>Catching and killing prey<br>Collecting shellfish |
| Processing food | Farming | Important e.g. threshing, grinding |
| | Hunting/Gathering | Minor—cracking shells and nuts |
| | Fishing | Drying |
| Transporting and Storing | Farming | Very important, esp. over distances before storage |
| | Fishing | Storage |
| | Hunting/Gathering | Some degree of transporting. Storage very negligible |
| Eating food | Both | Very small or negligible |

Modified from Lawton (1973:62)

The basic unit of energy budget measurement has been the calorie, expressed as calories per individual per unit time. With increasing use of the S1 units the Joule (J) is now being adopted as the unit of energy, 1 calorie being equal to about 4.18 J, but the calorie will be used in this study.

In sum, therefore, it is clear that concepts of energy costs and gains in food procurement activities and of energetic efficiency in terms of viable economies and the important question of human needs are all related to concepts of nutrition.

## 4. The Concept of Nutrition

Nutritionists are concerned with quality and quantity of food taken as manifested in malnutrition and undernutrition. While malnutrition which is the deficiency in the quality of food intake is responsible for specific diseases, undernutrition leads to the loss in body weight and reduced capacity to work and general reduction in resistance to disease.

### a) Food Needs

There are many contradictory opinions about what people need. It would however be expected that the food needed by an individual will be that amount in the right quality which would maintain the body at a constant weight and keep the individual in good mental and physical condition.

The weight of this food is a function of four variables—the size of the skeletal frame (which to a large extent depends on age), the amount of physical exertion undertaken, the environmental temperature, and the composition of the food.

Minimum daily food requirements have usually been calculated in favour of national food balance sheets (FAO 1963) though these calculations have been criticized (Clark 1970; Grigg 1973) because they do not rely on the incidence of dietary deficiency symptoms. Great emphasis has been placed on the importance of minimum daily protein requirements and figures have been fixed as 'high' as 89 grams, as 'moderately' as between 45 grams and 65 grams and as 'low' as 36 grams for an adult (United States of America Committee 1967: 53; Carpenter 1969; Clark 1970). A mean figure of 50 grams is regarded as adequate for a moderately active adult in the eastern Niger delta. This is equivalent to 850 KJ in energy terms.

It has been stated that energy budget measurements are given in calories or Joules. A calorie intake of 2000 is considered adequate for a moderately active adult. This is about 8360 J or 8.36 MJ. On studies conducted among Indian communities, Sukatme (1973) concludes that 'protein deficiency is for the most part the indirect result of inadequate energy intake' (1973:25). In other words, the calorie content of a diet is to a large extent the determinant of what proportion of a diet is used as protein in the body. This is because in a meal deficient in calorie content and rich in protein, the protein is first converted into energy quantities and used up as such with little regard to the body need in protein.

In this study therefore emphasis on the food resources—plant and animal—is placed on the energy (calorie) value of the particular resource. This is

Table III. 4 Average Daily Food Consumption of Two Niger Delta Groups

| Foodstuff | Scientific Name | ILLU farmer (g) | Soragbemi fishermen (g) |
|---|---|---|---|
| Maize mature | Zea mays | 29 | 15 |
| immature | | 7 | |
| Cassava flour | Manihot utillisima (Pohl) | 143 | 186 |
| starch | | 172 | 92 |
| fufu | | 63 | |
| fresh tuber | | | 77 |
| Yam | Dioscorea sp. | 633 | 63 |
| Cocoyam | Colocasia antiquorum | | 12 |
| Plantain | Musa paradisiaca Linn. | 14 | 13 |
| Banana | Musa paradisiaca Linn. | 14 | 13 |
| Banana | Musa sapientium | | |
| Sweet potato | Ipomea batatas | | 19 |
| Cowpea | Vigna sinensis | 13 | |
| Jak fruit | Artocarpus integer | 3 | |
| Ground nut | Arachis hypogea | 2 | |
| Pumpkin seed | Curcubita spp. | 1 | |
| Coconut kernel | Cocos mucifera | | |
| Oil bean kernel | Pentaclethra nacrophylaa | 1 | |
| Kola nut | Kola acuminata | 1 | 1 |
| Okra fresh | Hibiscus esculentus | | |
| Green leaves (bush) | Corchone sp., Amaranthus sp. and others | | |
| Pepper red dry | Capsicum frutesens | 3 | 4 |
| fresh | | 3 | 1 |
| Tomato fresh | Lycopersicum esculentum | 2 | |
| Mango | Mangifera Indica | 2 | |
| Fish fresh | (From lake & estuary) | 18 | 165 |
| dried | (different species) | 18 | 78 |
| Shrimps dry | | | 1 |
| Oyster local | | | 7 |
| Prawns fresh | | | 4 |
| Goat | | 6 | |
| Monkey dried | Various species | 17 | |
| African snail | Archachatina sp. | 3 | |
| Palm weevils | Rhynchophorus phoenicis | 1 | |
| Frogs | Rama mascaremensis | 3 | |
| Pangolin | Manis longicandata Manis tricuspis | 3 | |
| Porcupine | Aterurus africanus | 2 | |
| Cane rat | Thryononys swinderianus | 1 | |
| Giant Gambian rat | Cricetomys gambianus | 2 | |
| Palm Oil | Elaeis guinensis | 35 | 27 |
| Sugar Cane | Saccharum officinarum | 3 | 4 |
| Palm wine (ml) | from Elaeis guineensis & Raphia vinigera | 250 | 103 |

(contd.)

Table III. 4 (cont.)

| Foodstuff | Scientific Name | ILLU farmer (g) | Soragbemi fishermen (g) |
|---|---|---|---|
| Local gin (ml) | from above | 13 | 107 |
| Nuts | | 1 | 1 |
| Salt imported | | 5 | 7 |
| Mangrove | | 3 | 4 |

(Adapted from Nicol BM 1952:37)

Table III. 5 Daily Nutrient Intakes of 2 West Delta Groups

| Nutrient | ILLU[a] farmers | Soragbemi[a] fishermen | Minimum Individual[b] daily requirement |
|---|---|---|---|
| Calories | 2252 | 2192 | 2000.00 |
| Protein Animal (g) | 17 | 68 | 50.00 g |
| Vegetable (g) | 26 | 12 | |
| Fat (g) | 43 | 39 | |
| Carbohydrate (g) | 424 | 379 | |
| Vitamin A (i.u.) | 7348 | 5655 | 2500.00 |
| Aneurin (mg) | 0.69 | 0.30 | |
| Riboflavin (Vit. B2) (mg) | 0.65 | 0.68 | 1.50 |
| Nicotinic Acid (mg) | 8.- | 12.1 | 12.00 |
| Ascorbic Acid (Vit. C) (mg) | 30 | 40 | 20.00 |
| Calcium (mg) | 664 | 2894 | 75.00 |
| Iron (mg) | 21 | 24 | 10.00 |

Data adapted from: a) Nicol 1952, b) Bender, A. 1968, Diem, K. 1962

used in shell midden analysis, food crop and animal resource evaluation in Chapters VI, VII. Table III. 4 gives a good example of the food items used by two groups of Nigerians engaged in subsistence activities, the one a yam cultivating community (Illu farmers) and the other a fishing community of the western Niger delta (Soragbemi fishermen).

Table III. 5 compares the daily nutrient intakes of these two groups of people with those recommended as the minimum daily requirements. It is clear that the food items are purely indigenously or locally produced and their nutrient contents are well above the minimum recommended daily quantities and qualities. Table III. 6 compares the amounts of protein and calories supplied by these diets per kilogram of body weight with the recommendations for the United States of America. In each case except for animal protein for the Illu farmers and vegetable protein for the fishermen, the contents of the Nigerian diets are well above the levels recommended by the National Research Council of America.

Table III. 6 Amounts of Protein and Calories Supplied by the Diets per kg body Weight

| | ILLU[a] farmer | Soragbemi[a] fisherman | U S A[b] N R C |
|---|---|---|---|
| Mean weight (kg)(man or woman) | 50 | 54 | 63 |
| Calorie | 45. 04 | 43. 92 | 37. 50 |
| Total protein (g) | 0. 86 | 1. 48 | 1. 04 |
| Animal protein (g) | 0. 34 | 1. 26 | 0. 68 |
| Vegetable protein (g) | 0. 52 | 0. 22 | 0. 35 |

Data from: a) Nicol 1952; b) NRC 1948. Data was given as lb/body weight now converted to kg/body weight. 12. 5% reduction in calories allowed for the effect of climate upon basal and total basal metabolic rate (Keys 1949).

In general our working hypothesis assumes that human groups will place a premium on high energy-yielding food resources and will endeavour to procure them whenever they are within reach. In consequence therefore the exploitation of the available plant and animal resources will be geared toward the satisfaction of these ends. The archaeological data was expected to reflect this. As a result the excavations of shell middens (Chapter V) and shell midden analysis (Chapter VI) have been structured to test whether this hypothesis is valid for the Niger delta and if not what alternative explanations account for the discrepancy.

b) Composition of Foods

Foods are assessed by their nutritional composition. The major nutritional components of a diet are carbohydrates,fats and proteins, vitamins and minerals, and much of man's search for food and good diet is met in the form of one or a combination of these. Again, equal weight of these food components give different amounts of energy when oxidized.

Carbohydrates supply about 80% of the total energy in eastern Niger delta diets. The principal sources, as in most other tropical countries, are root and tuberous crops—yam, cassava (manioc), plantains and coco yam. It is difficult to imagine a diet relying on local foodstuffs without carbohydrates from these 'starchy staples' (Johnston 1958). Their value in part lies in their supply of large quantities of energy though they also contain other nutrients (Tables III. 1, VI. 16).

Fats like carbohydrates are present in all diets though they are more abundant in vegetables from where they are largely derived. The main source of edible oil in eastern Niger delta is the palm oil (Elaeis guineensis). Animal fat though used is not abundant because most of the animals eaten are from the wild and unlike domestic animals are not rich in fat. Fats also have a high calorific value supplying some 37 KJ per gram as against the average supply of 17 KJ per gram by each of protein and carbohydrate. In warm environments like eastern Nigeria, fats are not in essential demand as there is not the need to keep warm and the calorie value of fats is not easily available as fats are not easily absorbed into the body.

Proteins provide the raw materials for the synthesis of enzymes, the proteins that structure the tissues and for many other cells. Rich sources of proteins include beans, legumes, and some other vegetables as well as fish, shellfish, snails and animal meat. Proteins differ in their composition and nutritive value and are needed for different jobs according to the age, physiology and physical activity of the person concerned.

The dichotomy between 'first class' and 'second class' or 'good' and 'poor' in reference respectively to animal and plant proteins is fallacious because 'food proteins...are used for many different purposes and operations in different environments' (Pirie 1976: 106). It has been stated earlier that proteins in the form of amino acids not picked up and used by a cell are ultimately used up as sources of energy and never vice versa, unlike carbohydrates which may be stored in muscles and used up later.

Apart from the Niger delta, 98% of the protein intake in eastern Nigeria is of vegetable origin, yet "a very good state of physical development is achieved" mainly because of "a wide range of plant foods which are eaten to supplement the staple yam, including many varieties of leaves, legumes, nuts and fruit" (Nicol 1954:6-7).

Vitamins and minerals are needed in very small quantities of less than 0.001 to 1 g a day. A deficiency is unlikely in a diet because most of the elements occur in all parts of animals and plants. Meat and liver supply iron, palm wine is rich in several vitamins while exposure to sunlight satisfies the vitamin D requirements of the body.

Conclusion

Energy considerations are very crucial in human decision making. With respect to subsistence economies in eastern Nigeria where much of the output of the food crops is for family subsistence, it is reasonable to expect that farmers, gatherers, fishers and hunters aim at the highest return per hectare and/or per hour of work in food value. Hence emphasis is placed on relative yield in terms of food calories and what is more food value is placed more on calories or energy return than on nutrient composition. Subjective as this attitude may appear to be, there is still a close correspondence between food value and calorie or energy value in the long run (Galletti et al. 1956:322; Kaberry 1952:84).

# CHAPTER IV

## SPATIAL PATTERNS, RESOURCE DISTRIBUTIONS AND HUMAN SETTLEMENT

### INTRODUCTION

Studies on African Quaternary geology, climate and palynology which have mostly been in East, Central and South Africa (Bishop and Posnansky 1960; van Bakker 1967, 1972a, 1972b; van Bakker and Butzer 1973) with few in West Africa (Servant and Servant 1970, 1972; Burke et al. 1971), suggest alternating wet and dry phases, the so-called pluvial, sub-pluvial and inter-pluvial periods. These have been said to correspond to the major glacial periods in Europe and America but the suggestions have been criticized on the grounds that they can be shown not to be contemporary and are less wide-spread in Africa than imagined (Flint 1959; Wai Ogusu 1971; van Bakker 1976). The present state of knowledge of African Quaternary chronology has been summarised (Nzewunwa 1979:80).

The suggested late Quaternary climatic variations in the Niger delta (Table IV. I) are discussed by Sowunmi (1976) and NEDECO (1959) and although the data for Nigeria are very limited they show that the last 20,000 years in the Niger delta has been characterized by tectonic movements— subsidence alternating with upheaval as well as changes in sea level and variations in the climate. Here interest is focussed on the factors responsible for the recent formation of the delta and the characteristics of delta ecology as they affect resource distribution, exploitation and human settlement.

### 1. Formation of the Delta

a) History

From Tertiary times onwards the size of the delta has varied widely. At its greatest in Tertiary times Idah may have been its peak, 285 km from the present coast. Below Idah the Niger today is bordered on the eastern bank by gently sloping, low hills of Tertiary sandstone of the Imo Shale Group and Bende Ameki Group which Allen (1964) says are deltaic in origin (see Fig. II. 1).

Further south a plain of alluvium about 32 km wide stretches as far as the Anambra River. The low river banks here are covered with dense vegetation and today support many towns and villages. Here the river flows with a uniform slope through a two kilometre wide river bed. When the water level falls 1.5-3 metres below the high water mark during the low water season, numerous sand banks emerge.

Some 373 km from the coast, at Onitsha, the Niger valley narrows for the last time and the river passes through a probable fault in the sandstone hills of the Bende-Ameki Group. It now flows through its own alluvial deposits which are bordered on both sides by the Coastal Plains Sands of the Oligocene-Pleistocene periods.

Table IV. 1 Suggested Late Quaternary Chronology of the Niger Delta (Data from Sowunmi 1976)

| Time (Years in 1000s YBP) | Lithofacies | Climate |
|---|---|---|
| 5.75-Present | | Wet |
| 7.25-5.75 (Climax at about 6.9) | Sandy Deposit | Dry |
| 8.5-7.2 | Silty Sand | Wet |
| 9.37-8.5 | Sandy Deposit | Dry |
| 9.5-9.37 | Silty Clay Deposit | Wet |
| Pre-10 | Mostly Sandy Deposits | Dry |

Data from Sownnmi 1976a, b

A maximum annual discharge is noted at Onitsha, below which the river banks are lower resulting in much water flowing over the adjacent flood plains into the Orashi River on the east, and the Ase River on the west bank, At Aboh, some 285 km from the coast, the river separates into many branches, reaching the ocean with a vast delta. Aboh may therefore be considered the peak of the delta (see Fig. II. 2), for the period under review here.

b) The Chronology of Deltaic Development

i) River Studies

According the NEDECO a fall in sea level about 22,000 YBP initiated the present delta though the actual formation did not start until 7,000 YBP and the process is still in progress. The sediments responsible for this process were derived from three main directions—the Niger and Benue drainage basins, and minor sediments along the coast moving from the Volta River Basin; and minor rivers within Nigeria (rivers Ogun, Osun, Cross) (Allen 1964b).

The chronology for the build-up of the present delta holds that the coastline of Nigeria moved southwards from an inland location at Onitsha, 373 km from the coast, at about 75,000 YBP. The coastline receded to between Samambiri and Aboh, 285 km from the coast, by 45,000 YBP, then to between Siama and Burutu between 55,000 YBP and 30,000 YBP. A sea regression and gulley formation occurred about 22,000 to 12,000 YBP followed by a sedimentation during a subsequent sea transgression about 10,000 to 7,000 YBP. It was in the period 7,000 YBP that the present delta began to form (NEDECO 1959). Table IV. 2 is a graphic presentation of this process.

ii) Results from Palynology

Investigations undertaken by Sowunmi (1973, 1975, 1976) in the eastern Niger delta were aimed at obtaining information on its vegetational and climatic history. These studies which were concentrated in the Nembe-Brass area would seem to have a large degree of application to the entire Niger delta. She combined the analysis of surface samples (0. 0-5. 0 cm) and analysis of cores (0. 0-36. 26 m) (Sowunmi 1976). A list of selected major plants identified by her studies is found in Nzewunwa (1979 Appendix II). Meanwhile emphasis will be placed on the data which bear relevance to the climate and their effects on soils and the vegetation and consequently on faunal life. The data obtained from Sowunmi (1976) is summarized in Table IV. 3.

Of particular chronological interest is that two dates were obtained by the Shell (British) Petroleum Company for two depths in their Nembe-Brass core—10000 YBP for level 30. 26 m and 6000 YBP for levels 13. 38 and 17. 60 m. Sowunmi has by extrapolation suggested the other dates used in Table IV. 3. In conclusion Sowunmi (1976:12) suggested " that this region was very inhospitable and ill suited for human occupation during the dry periods".

Although no artefactual materials can be connected with the SBPC cores, and human settlement is not yet attested for this area prior to the 1st millennium A. D. , it is difficult to accept the validity of a thesis of "inhospitable" and "ill-suited" environment in the dry periods except perhaps for farmers.

Table IV. 2 Build-up of the Niger Delta

| YBP (in 1000 yrs) | Sea Movement | Geologic | Location |
|---|---|---|---|
| 7 | In progress | Unconsolidated | Present delta |
| 10-7 | Sea transgression | Sedimentation | |
| 22-12 | Sea regression | Large gullys | |
| 55-30 | Further recession of coastline | | Siama-Burutu |
| 45 | Recession of coastline | | Samambiri-Aboh |
| 75 | Inland coastline | | Onitsha |

This is because the latitudinal position of the Niger delta and the suggested rainfall are in conflict with such a thesis. Even in periods of severe dryness it can be argued that favourable conditions existed for hunter-gatherers in the delta. There is reason to suggest that dry 'islands' would be available for human habitation as opposed to wet swampy muddy mangrove flats of the wet periods. A readjustment would be expected on the part of human and animal populations affected. That it would lead to an abandonment of the delta is unlikely. The rainfall within the hinterland is conditioned by the wind currents along the coast so that a period of severely dry conditions would affect the hinterland groups more adversely and perhaps initiate a process of movement towards the coast and not vice versa. A similar situation is argued for the Central African rain forest by Van Zinderen Bakker (1976:54) using data from the Amazon rain forest (Vuilleumier 1971).

The nature and quality (as well as the presence or absence of suitable host sediments) of pollen and spores within the Niger delta must also be considered in the light of transportation mechanisms involved. In the first place the sediments originate from a variety of geological sources along the course of the River Niger and must invariably exhibit a variety in structure and quality. Even with the delta itself the intensity of discharge and flows within and between seasons and tidal currents must be taken into account in interpreting the lithofacies (Fig. IV. 1).

In the second place spores, pollen and even sand are subject to wind and water transportation and these agencies also account for the presence and absence of certain plants in the delta. In the same manner redistribution is likely to take place beyond the primary deposition in response to creek and tidal flows. The very process by which delta features and environments come into being must be added to the above factors (see Ecology of the Delta below). In the light of the foregoing it is uncertain whether the Sowunmi interpretation based on the absence of pollens and spores can be interpreted as severe arid conditions.

Considered within the proposed chronological framework (Tables IV. 2 and IV. 3) the climate for the past 10,000 years shows an alternating trend of dry to wet dividing into three dry phases and three wet phases (Table IV. 1). The value of the schema rests on its pioneering aspect. It would be helpful to the understanding of man and environment to consider other aspects of the delta ecology.

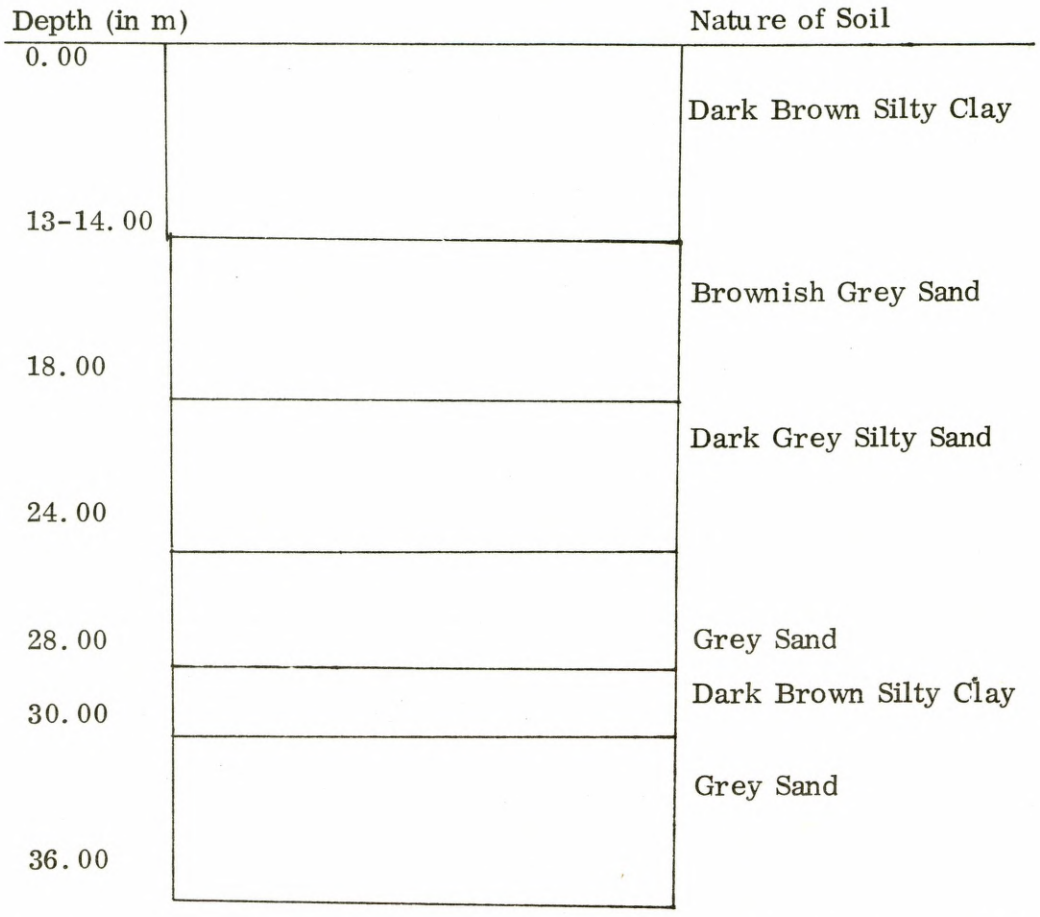



Fig. IV.1 Lithofacies of Core No. 22 Shell B.P. (after Sowunmi 1976)

## 2. Ecology of the Present Delta

As mentioned already the River Niger enters the sea through a number of mouths. Here salt and fresh water mix for some distance resulting in an ecosystem that includes transitional areas, salt and fresh water swamps, sandy beaches and mud flats, subjected to tidal influences.

The study of the development of the Niger delta ecology involves a study of succession (Chapman 1976) the details of which are outside the scope of the present study. In brief, three stages are critical: i) the existence of bare ground which arises as deposited mud; ii) the bare ground is invaded by a set of first colonists (plants); iii) successful seed germination and existence of good conditions (water, temperature, predator-free) to facilitate growth, fruition and reproduction. The nature of invasion in the second stage depends on nearness of potential seed parents and the methods of seed dispersal (wind, animal or sea).

The presence of plants gives rise to a variety of reactions resulting in soil improvement, arrival of other plants and even animals. The importance that attaches to the biota varies with the community but the varying animal and plant communities come to be associated with particular sections of the environment though some accommodate more than one.

Table IV. 3 The Niger Delta: Ecological Variations in the last 10,000 Years (Data from Sownnmi 1976)

| YBP (1000 yrs) | Depth (m) | Litofacies | Vegetation | Climate |
|---|---|---|---|---|
| | 0.58 | Dark brown silty clay | Conifer, Podocer pus. sp. Not natural in Nigeria. Transportation 450 km Cameron Mt. | Wet condition |
| | 2.50 | | Savanna and mangrove and forest pollen. Savanna transported 230 km from north or locally derived (intensive human activity, burning) | Generally wet. Some periods wetter |
| 5.75* | 12-13 | | | Generally wet. Human settlement expected to have started |
| 6** | 13-38 | Change in lithofacies: silty clay through silty sand to sand | Reduction of pollen count. Absence of grass pollen | Arid condition. Adverse environmental condition |
| | 13.70 | | Reduction of swamp vegetation | |
| | 17.60 | Brownish Grey sand (14.00-18.00) | Complete lack of pollen and spores | Climax of arid and unfavourable condition |
| | 18.97-19.00 | Dark grey silty sand (18-24 m) | High grass pollen content | Slight improvement perhaps drier condition than pre 13 m deposit as high grass content suggests. Wet interruption |

| | | | | |
|---|---|---|---|---|
| 8.50 * | 23.80 | | High total pollen count. Reduced grass pollen | Climax of improved situation |
| | 24.56 | Grey sandy sediments (between 23.90 and 27.50) | No pollen or vegetation. Absence of vegetation | |
| 9.50 * | 28.12 | Dark brown silty clay | Partial establishment of mangrove | Slight wet. Habitation suspected |
| 10.00 ** | 30.26 | Lithofacies change clay-sand | Total absence of pollen spores | Dry. Poor environmental condition |
| | 32.32 | Intrafacies change sandy and clay Intermingling of deltaic and littoral sediment | Striking total pollen count. Some mangrove | Brief wet |
| Pre 10.00 * | 36 | No deltaic sediment. Blocking of Niger river mouth | Unfavourable for plant growth | Dry. Drastic reduction in waters of Niger river |

Chronology: * Interpolated (Sowunmi 1976); ** Shell B. P. Absolute dates.

Although the sea shore can be divided into a number of zones or belts using biological (Lewis 1961; Yonge 1949) or geographical criteria (Stephenson and Stephenson 1949) a bio-environmental approach seems adequate as it invokes both biological and environmental sub-divisions hence 'sandy beach', 'fresh-water', and 'saltwater lagoons', 'coastal plains', 'swampland' are employed when necessary.

Because life of all kinds in the delta is more or less marine dominated, a number of factors that affect the number and distribution of plant and animal populations may be unusual. These include the temperature of the seawater which affects respiration and photosynthesis, the photoperiodicity or length of day; the physiographic factors include tides which cause exposure or sub-mergence, the degree of wave action, tidal currents which affect plant size and growth and of course determine the rate of creek erosion and silt deposition. The zones may now be considered in turn:

a) The Swamps

In the early stages of colonisation, mangrove swamps between high and low tide are covered with phanerorganic (flowering) vegetation and subject to periodic flooding by the sea during which period mud is deposited on the swamp as the water movement slows down resulting in gradual elevation in land height.

A knowledge, and rate, of the factors responsible for their sedimentation is important as the sediments may be of silt or sand blown from the beach, the latter can provide complications since it is dependent upon the intensity of prevailing on-shore winds and the incidence of gales (Chapman 1976:94).

A physiographic feature important in swamp environment is the creek. Its future course depends on irregularities of the ground but having formed, the channels are gradually enlarged by scouring action of water after each tide. The maze of creeks which runs intricately through parts of the delta from east to west even as far as Lagos, makes it possible for the delta communities to be in constant touch with one another. They are in short the 'highways' of the delta. Minor branches are more numerous on muddy flats.

As accretion takes place the land rises gently, the number of floodings become fewer and fewer. With the decrease in floodings and a consolidation of the ground new changes are brought about that also result in altering the existing environmental conditions.

The dominant vegetation in the swamp is the mangrove, Rhizophora sp. (R. harisonii, red mangrove and R. racemosa, white mangrove). The role of the mangrove in consolidating new land has been widely discussed (Davis 1938; Rosevear 1947; Chapman 1975).

Although the biota will be discussed below it is important to note that these swamps offer three habitats: i) a tree canopy for arboreal animals from adjacent terrestrial forest, and birds; ii) mud flats, the subsoil where molluscs and crustacea live; iii) channels with alligators, crocodiles, mudskippers and other types of fish. According to Chapman (1976:232) there is nothing like a specific mangrove fauna as most of these belong to adjacent terrestrial ecosystems or typical of saline mud flats.

b) The Sand Dunes and Beaches

The beach ridges of Brass, Bonny and the inner coastal islands of Dawes and Isaka are characteristic of sand dunes that occur also in coastal regions. The formation of sand dunes is attributed to two major phenomena: the availability and supply of sand together with the wind to move it.

The sand comes at first from sand flats exposed at low tide and plant growth helps trap more sand by obstructing drifting air-borne sand. Sand dunes are subject to instability in their size and shape and are known to succumb to wind erosion and wave action depending on the degree of consolidation and vegetation cover.

Water-loving and burrowing animals make good homes on sand dunes.

c) Solid Ground

The bulk of solid ground in the delta is situated in the coastal plain immediately north of the swamps belt. (The sites of Elekahia, Eleme, Onne, Alaocha and Okochiri are located in this belt.) This environment favours a combination of forest species. Tropical rain forest would be the natural vegetation cover and would be host to a wide variety of animals and birds.

The solid ground in the coastal plains which fringe the delta also lie within the forest belt where there is a good supply of freshwater which most delta areas lack. This is also where the terrestrial mammals and wild fruits and vegetables are found in large numbers and varieties.

3. Resource Distribution

The distribution of resources in the Niger delta follows the spatial patterns and ecological constraints discussed in the preceding section. The major resources may be broadly grouped under the marine, terrestrial and aerial (Table IV. 4). Modes of exploitation and distribution are discussed in Chapter VII. The following study is limited to the tropics, especially to the Niger delta.

a) Marine Resources

i) Mollusca: The phylum mollusca covers the soft-bodied unsegmented invertebrates normally having a hard protective shell, with a special extension of the body wall called the mantle.

Ecological studies show that molluscs inhabit all habitats of the sea and shore, and that each species is adapted to a unique niche; some to more than one from rock through sand to mud or even from splash to intertidal belts. Some burrow into sand and mud, others attach themselves to roots of mangroves yet others move over weeds and leaves.

Feeding characteristics also differ among molluscs. Some are herbivorous, some carnivorous, others omnivorous. Herbivorous species are mainly browsers or filter feeders depending largely on detritus originating from dead plankton and from the tidal environment.

Within the phylum mollusca there are either five (Clayton 1974), six (Dance 1971) or seven classes as claimed by Yonge and Thompson (1976). They are briefly described.

Table IV. 4 Simplified Environment and Resource Zones

| | Mangrove Swamp | Freshwater | Coastal Plain |
|---|---|---|---|
| Geology | Muddy, swampy consolidating | Periodic dry, consolidated | Consolidated land |
| Physiography | Tidal floods<br>At or below sea level | Annual flood slightly above sea level | Dry<br>Above sea level |
| Vegetation | Forest mangrove | Dense rainforest | Modified rainforest |
| Settlement | Sparse | Sparse | Dense |
| Major economic activity | Fishing<br>Shell fish collecting | Cultivating<br>Fishing<br>Shell fish collecting<br>Hunting | Cultivating<br>Hunting |
| Major resources | Fish<br>Shellfish<br>Crustacea<br>Marine mammals<br>Birds | Food crops<br>Fish<br>Land animals<br>Shellfish<br>Crustacea<br>Birds | Food crops<br>Mammals<br>Birds<br>Land molluscs |

The Monoplacophora, the most primitive of molluscs possess segmented fragile bodies, paired gills, rows of teeth (radulae) but no eyes. They were only discovered in the 1950s (Yonge and Thompson 1976) and are not used by man.

The Amphineura—chittons or coat of mail shells—have "a series of eight shelly plates, arranged serially and held together by a leatherly girdle" (Dance 1971:7). They possess radulae but no eyes and no tentacles. They are not used as food by man.

The Scaphopoda are tusk shells without head, eyes or gills but are mostly bisexual. The shell is hollow, the animal has a plug-like foot and strong radulae. These are also not useful for food.

The Cephalopoda—large intelligent and rapacious invertebrates—include the octopus, cuttle fish and squids. They possess prehensile tentacles and parrot-like beaks. They are used at times as food resources in the delta.

The Aplacophora are very small worm-like mollusca and are said to be numerous and diversified but not used by man.

The Gastropoda are univalves or snails. They are reputed to be the most numerous and diversified of the molluscs. These are widely used for food and are discussed below.

The Bivalvia or Lamellibranchia are the mollusca with two shells or valves. They are used by men and discussed in detail below.

Among the molluscs there are over one hundred thousand known species made up mostly of Gastropoda, 80,000 species marine, freshwater and land; Bivalvia (bivalves) making up about 20,000 marine and freshwater species. The others range from 500 species for Amphineura (all marine), 400 species for Cephalopoda (all marine), 300 species for Scaphopoda (all marine) and about 5 species for Monoplacophora (all marine). Among the sea molluscs only the Gastropoda and Bivalvia are useful for human food and will be discussed here.

The Gastropods

This class includes all molluscs that crawl on broad-based foot and have single typically spiral shell. They include the 'stomach-footed' sea snails, the whelks, trumpets and conchs. They divide into three sub-classes—the Prosobranchia or large marine snails; the Opisthobranchia or large sea slugs with reduced shell and mantle cavity which is lost in some species; and the Pulmonata or the land snails and slugs where the mantle becomes a lung—the majority being terrestrial. Only the Prosobranchia and Pulmonata are of interest to this study. They are found in both the saltwater and freshwater zones.

Studies of West Africa prosobranchia by Knudsen (1946) using materials acquired by the 'Atlantide' Danish Expedition to West Africa in 1945-46 show that there are about 600 species in West Africa, the majority of which are non-pelagic in their development, a situation that contrasts to that observed in other tropical areas. One postulated cause is the strong exchange of water between coastal and ocean waters caused by the Guinea Current which sweeps larvae to the open sea where they are unable to propagate even if they metamorphose (Knudsen 1946:127). This strong mixing of coastal and ocean water added to the influx of cold water during the rainy season months of July-September and some other months (Howat 1945) cause a drop in temperature which is known to be lethal to the larvae of invertebrates (Thorson 1946).

The second postulated cause is that Guinea Current is very poor in nutrient salts and that plankton is very scarce along the coast of tropical West Africa (Sverdrup et al. 1946). Pelagic larvae are known to depend on diatoms (nannoplankton). A food problem therefore partly explains the non-pelagic development of West African prosobranchia.

Periwinkles

The West African periwinkle Tympanotonus sp. differs from the common European Littorina sp. in shape. The West African species is conically shaped, the body whorl tapering into a spire more like a volute than a snail. They are the most dingy of the Niger delta molluscs usually being black, occasionally brown and reaching lengths of 6 cm.

The two most common species are differentiated on the external structure of their shells. The T. fuscatus fuscatus has thick shells with large tubercules and widely expanded apertures. This species is more common in deep waters normally between mud flats and mangrove swamps. They are in fact ceriths

in appearance. Field studies undertaken for this study show that these species are much more common in the areas close to the sea. This was observed in the Nembe-Brass area and in fact is well represented in the shell middens of that region.

The second species, T. fuscatus radula, or simply T. radula, has no large tubercles and is more common in shallow waters in the landward areas and is well represented in the middens at the edge of the coastal plains (Okochiri) or in islands closer to the area as in Okrika. Beyond this basic difference in ecological terms the two species are highly valued today, as was observed in the field in 1976/77.

The periwinkles hardly migrate from the immediate vicinity of their birth. Essentially herbivorous they browse on seaweeds, small growths and refuse with their rasping, ribbon-like radula.

Like most other gastropods, the perinwinkle lays eggs, fertilized within the mother, wrapped in an egg case which is retained until the young periwinkle is able to start crawling and feeding, thus reducing the risk of loss to the high sea by currents. This accounts for the dense population of the delta mud flats.

An advantage of using the periwinkle as a resource is its ability to store well out of the sea for over six weeks and an ability to live in freshwater for over ten days, in contrast to other marine animals (Berrill and Berrill 1957: 89). Experiments conducted for this work showed that as long as the animal was not exposed to direct sources of heat they could store for over two months and once deshelled the meat would stay fresh for about five days if stood in freshwater with access to fresh air. But once dried they could last for 6 months and perhaps much longer if occasionally exposed to the warmth of the fire. The other species of mollusca showed ability to preserve well only when dried, the live gastropods could only be stored for a few weeks if left in a cool place.

Whelks and Sea Snails

These are carnivorous snails. Two species or families are known in the delta, Thais sp. and Semifus sp. The relationship, if any, between the two is not clear but their feeding habits and somewhat snail-like body shape warrants their discussion together.

Thais sp. or Thais coronata (Knudsen 1946) is smaller in size growing up to 5 cm with strong shells, a characteristic wide but reduced siphonal canal separated from the aperture by a strong thick everted shell ridge. The shell is covered with rows of undulating folacious extensions and ends in a suppressed spire.

The Semifus sp. or dilated whelk is similar to the cold water species Penion dilatatus in shape. The shell is large, thick, sculptured with deep grooves, indented sutures and slight bumps on the angular shoulders of the whorls (Clayton 1974:38). Starting with a characteristic long siphonal canal the shell ends in a high spire reaching a length of over 16 cm.

Both families are intertidal gastropods but Thais coronata is more common. Thais coronata is found on mangrove trunks where it lays its eggs in capsules

in great numbers which take some four months to emerge into full shelled individuals. Out of several hundreds only a dozen are said to mature. Perhaps this is a blessing to those who value other shellfish for the whelk being carnivorous usually feeds on bivalves and dead fish and is dangerous to oyster beds. With rasping radula they drill narrow holes through the shells of their prey either rasping out the flesh with the proboscis or injecting pupurin, a highly poisonous purple dye which makes the prey relax its muscle (Berrill and Berrill 1957).

Marginella sp. possibly M. Ambigua

This shellfish resembles the melon or baler shellfish, Melo melo, of the Indian Ocean. It is a large volute with a highly reduced spire. The body has a rounded whorl with a large wide flaring aperture.

It is rare and according to oral reports is procured by chance on the high seas away from other species. Throughout the field study only two shells were seen; these were recovered from the Okochiri excavations. The species may be carnivorous as are the baler or melon shellfish. The biggest of the shells measured some 20 cm in length. Because of their rarity they will not be considered as important in dietary considerations of the delta.

Bivalves

These two-shelled or two-valve molluscs include oysters, cockles and clams. Bivalves in West Africa differ in size, shape and distribution as the work of Nickles (1955) shows.

Oysters

The mangrove oysters Ostrea tulipe or Gryphaea gasa are found in large clusters attached to mangrove roots or to each other by hooked projections of the shell. They range in colour from pale brown to purplish brown. With a rough and lanellate surface the actual shape is determined usually by the habitat and degree of crowding but most are irregularly leaf-shaped and elongated (Murray 1973). The delta oyster grows to over 10 cm in length and 5 cm in width.

Oysters are marine and brackish water animals with a variety of species in West Africa (Nickles 1955; Powell 1977 pers. comm.). Once settled at the larval stage, oysters remain immobile for the rest of their lives.

Some oysters mature first as males then change sex to female and are in a position to produce eggs in the next six months. Though they change sex every few months, they are normally one sex at a time. Female oysters have a high propensity for reproduction. One can lay between 50 million and 500 million eggs in one spawning season (Dance 1971; Berrill and Berrill 1974: 116). Thus with a life span of some ten years an oyster may produce a total of some 5 billion eggs.

The oyster is attacked by predators among which are starfish, crabs and whelks (at times called the oyster drill). Dance (1971) remarks that the oyster has a notoriously high infant mortality rate. Considering its longevity, if it survives infancy, and its ability to change its sex as well as the quantity of eggs that it can lay in a given spawning season, there is little wonder that

the oyster has continued to maintain a high density of population and has continued to flourish wherever it occurs, despite predators. Within the delta, the oyster occurs in practically all known salt zone micro-environments where the mangrove swamp is established. It has remained a valuable source of food and the heights of middens with oyster concentrations supports the assertion.

Cockles

There are two observed species of cockles, the one a salt zone species, Anadara senilis also called Arca senilis and a freshwater zone species, Egeria radiata.

Anadara senilis has an extremely strong thick heart- or convex-shaped pair of shells. The surface is ribbed and the free edges are wavy. The animal contains an unusual red blood pigment haemoglobin which gives it a bloody colour. It grows up to 14 cm in diameter moving very slowly by means of a purely locomotory foot.

A. senilis burrow superficially into soft mud or sandy mud in intertidal waters and sandy mud shores where they are found in great numbers.

Saltwater cockles, A. senilis, occur in shell middens all over the saltwater belt of the delta and are still being exploited. A study of exploitation patterns and density of mollusca distribution undertaken for this dissertation showed that A. senilis is not as abundant as the oyster. Oysters were shown to be easier to collect as they could be seen on mangrove roots while the cockles required extra labour to locate and collect as they were hidden in mud or sand flats which needed filtering or close scrutiny.

Clams

Clams are not numerous or widely collected in the eastern delta. Ensis siliqua, the razor shellfish, may be eaten but this sand-boring species is rare and enquiries from fishermen and shellfish-collectors confirm that it is little collected today. The species has been recovered in archaeological contexts and attain a size of about 5 cm in length and 2 cm in width. The shells are fragile.

Studies of clams elsewhere (Rickets and Calvin 1948) show that they are fast diggers and are even prepared to lose part of the body in the process of escape. This characteristic would reduce their availability to man in the delta.

Freshwater Bivalves

Egeria radiata, was the only freshwater cockle recovered in the course of the field study. Although pear-shaped like other cockles it is not ribbed like A. senilis. Two blue bands run from the hinges towards the mantle usually covered by a brown cellulose film which peels away easily to expose the white shell. The species occur in fresh waters north of Nembe and south of Ahoada. Throughout the study the shells were never recovered in salt water shell middens and it is believed that survey in the freshwater zone especially in the Sombreiro-Engeni river complex would increase our knowledge of the species and of freshwater molluscs in general.

Marine/Land Molluscs

Although Archachatina sp. are essentially terrestrial they are found whenever the humidity is high. They vary in size, and perhaps in species, and are known to be capable of life in varied environments and have shells of many forms such as the screw shells and pulmonates which are smaller in size. There is difficulty in assigning the various types to specific studies (Nwosu 1977; Powell 1977, both pers. comm.).

Live samples collected during this field study showed, since no other research on their habits appears to have been carried out, that these snails are shore dwellers some living in sea water, some in brackish water creeks, others in freshwater. They can penetrate mud and exploit its rich supplies of food or live on weeds, grass or trees, usually crawling up and down leaving mucous trails as they move.

Archatinids are an important source of animal protein in the delta, as in the whole of Nigeria within the rainforest belt (Nicol 1952). They are intensively sought after during the day in swamps (and rain forests) all the year round, or, during the wet season at night with lanterns. Special snail-hunt tracks dressed with decomposing leaves and vegetable matter which attract snails and virtually become snail breeding beds are laid down during the night-hunting season.

They are on sale in most market places and along village streets sewn together on strings or prepared as roasted meat at roadside inns and village palm wine bars. Of late they have found their way in high class hotels and restaurants where as exotics they are eaten as an accompaniment to beer and other drinks. Information received in the course of the field study showed that they were more highly prized in the freshwater zone than in the salt water zone but this might also be a question of availability as well as of preference.

ii) Crustacea: These have soft bodies and shells. The fact that they do not possess shells as hard as those of the mollusca reduces the chances of their remains being recovered in archaeological contexts although they were recovered in a flotation experiment at Ibadan on delta samples (Alexander 1974, pers. comm.). But they are today an important source of food in the eastern delta. Among the crustacea are crabs, lobsters, prawns or shrimps. They are found in tidal pools and crevices, mud or sand banks.

Crabs

A wide variety of crabs are found in the delta but among the edible crabs are the large edible swimming crabs with coating of densely growing hairs similar to the velvet crab, Portumus puber. The horseshoe crabs, Limulus polyphemus, live in relatively quiet waters where they feed on worms and other small animals. Hermit purple clawed crabs, Coenobita clypeatus, are land crabs which inhabit the edge of the highest tidal flotsam where the land fringes the shore. But they breed in the sea. The blue crab, Callinectes sapidus, on the other hand, live offshore. Some of the crabs burrow into the ground, some dig tunnels in the mud like the fiddler crab, Uca pigilator, some others shelter in empty shells (Yonge 1949; Carson 1955).

Lobsters and Shrimps

The lobsters are scavengers living on seaweed and dead fish like mussels. They are found in tidal pools, mud, sand banks and crevices. Such species as the Spiny Lobster, Panulirus argus, have very large defensive claws which the small species in the same family such as the ghost shrimp, Callianassa stimpsoni and the crawfish (crayfish), Palinurus vulgaris lack. The ghost shrimp live in holes in tidal mud flats where they eat enormous sand and mud in search of bacteria, diatoms and detritus (Carson 1955). In the same manner the prawns, for instance the Leander, are found in various levels in the sea but the edible ones are found in pools, crevices by the shore or the edge of swamps.

In the delta women and children spend a long time at low tides filtering the crustacea from the ebbing tide, under crevices and tidal pools.

iii) Fish: Fish is an important food item in the delta and occupies a good part of the daily activities of some communities. A few observations are pertinent here. Captain Hugh Crow (1830:263-64) names a number of varieties of fish that were caught and eaten in the delta in the late 18th century. Maclaren's (1954) compilation of and comment on the pallatability of Nigerian fishes is perhaps the most comprehensive. There is a dearth of evidence in the area of fish densities or their value in food terms but these aspects of their economic value are discussed in Chapters VI and VII. It is clear that the delta communities fully understand the different species of fish and sea mammals and identify them by name. This is especially helpful in their exploitation as they would be well aware of what ecological situations in which they occur.

iv) Sea Mammals: Sea mammals may once have been more important than today. They include the manatee (at times called the sea cow), Trichechus senegalensis. So far only the bones of manatee have been identified, from the excavations at Ogoloma (see Table VII. 1). In the course of the field study it was observed in Ke that a shrine contained five heads of the manatee devoted to the hunter's deity by the hunter-priest.

b) Land Mammals

Rosevear (1953:11) observed that Nigeria presents a more diverse fauna from at least four different vegetation types varying from heavy rainforest to near-desert. It is traversed by a great river which becomes a faunal barrier; in the Cross River area two faunal zones—the West African and the Central African—meet. The animals of eastern Nigeria therefore are various and inhabit various microhabitats. Based on the observations and recordings of Rosevear (1953) those animals which may be of value as food resource range from the rodents through reptiles to carnivorous lions and leopards. The observation of early travellers, missionaries and administrators (Basden 1921, 1958; Talbot 1926:III; Hutchinson 1861; Hugh Crow 1834) confirms the use of wild animals, procured by hunting and trapping, for food and also mentions their depletion (Basden 1921, 1938) if not extinction as a result of the haphazard exploitation techniques (Nzewunwa 1976), based on firearms.

Although a number of animal bones had been recovered from excavations it has not been possible to identify the animals represented, since they are so fragmentary. It has become necessary to calculate their food value in general terms as the details on individual animal species are lacking (Chapter VI) and to use ethnographic models to reconstruct the exploitation strategies involved (Chapter VII).

c) Birds

The delta must always have been an attractive area for both land and sea birds — a possible food resource. Among fishing species, pelicans, kingfishers, herons, sandpipers, seagulls, curlews and egrets are recorded. Inland there is evidence (Crow 1830) that the geese, wild duck, pigeons, partridges, pheasants, doves, woodcocks and sparrows and parrots were often hunted but there is no clear indication to what scale the fowling was done. In reports by early travellers reference is made to the birds as part of the ecosystem and without regard to their contribution as food resource. The situation is not helped by the difficulty encountered in identifying bird species from archaeological situations although bones have been found at all the excavated sites. Observation during this field study suggested that birds play little part in today's resources although children and a few adults go fowling from time to time.

d) Domestic and Semi-domestic Livestock

Apart from the wild animal and plant resources there are a number of animals which are kept in closer association to man. Although these animals may be said to be domestic in that they have all been introduced into the delta by man, some are semi-wild and they are left to provide their food in the wild.

Domesticated livestock is not abundant in the Niger delta, nor ideed in eastern Nigeria. In the saltwater delta there is and was no effort to husband them (Crow 1830). In the freshwater delta and the mainland pigs, goats, sheep and cattle are kept more for their value as medium of exchange and investment than for consumption. Dogs are kept as guards and for hunting. They are also valued as food in the delta. In the same manner the poultry and their eggs are not often eaten except as remains from religious offerings and activities.

4. Human settlement

a) Settlement and Social Organization

When a human group occupies an area in order to exploit its resources, the resulting distribution of sites may be referred to as its settlement pattern. In other words, a settlement pattern is " a working relationship between people, their environment and their culture... in effect a balance that maximizes the utilization of resources and the expenditure of energy in a given population" (Knudson 1978:61).

Trigger (1968) suggested three analytical levels for the study of settlement patterns: the structure, the arrangement of structures into communities and the arrangement of communities within a particular geographical region. In

the following section we shall be concerned with those physical properties of contemporary settlement patterns in order to understand their determinants and so to help explain the location of archaeological sites discussed in Chapter V. In general population density in the delta is very low.

The structural units in the riverine delta (Horton 1969; Dike 1956; Jones 1963; Leis 1972) comprise the household, the local group (the community) and a group of these communities. The household is the most important unit in the local group as it is the primary social and physical environment of the natural family. This will consist of 5 to 20 persons. The house (wari) is rectangular in shape, built with mud and wattle walls, and thatch roofs although in some cases the walls are thatch. Today corrugated iron or aluminium roofs over concrete walls are a feature of the architectural system. There are slight variations in design but houses usually provide a verandah through which access is gained to all the rooms; a large sitting room from which doors lead to other rooms on opposed sides. In most cases wives' rooms are arranged on the same side of the long verandah. The main activities in a household are food procurement and preparation, protection and maintenance. It is also the focus for the daily economic out radiations and returns.

The community (Murdock 1949:29) or local group in the delta is made up of a series of households "located in fairly close proximity" (Knudson 1978:63) without walls or physical demarcations to set one dwelling off from another (Leis 1962:26). The fluidity of social intercourse is enhanced by these physical arrangements. It is these series of households that are responsible for the accumulation of the shell middens found here and there in the delta. Perhaps it is here that one can strictly identify a 'site' as most archaeological sites take their names from these households, communities or local groups,

But within the community there is a spatial location of activities which shows not only variety but frequent repetition. For instance places of worship are located in the centre of the community. Similarly, crafts which are exclusive to certain families (such as potting), are restricted to certain locations away from the households and communities, as in Afikpo. In Ogu potting is practised by few households. Although these activities exhibit area differentiation today their residues in most cases have not yet been identified archaeologically. However the varieties in the shell middens do not only reflect the variety of activities but also increasing complexity within communities.

The size and composition of communities are affected by the fact that in the social systems of the delta an individual may and does live within any local group where he has recognized consanguineal ties and to which he is limited by the type of marriage (Horton 1969; Dike 1956; Jones 1963; Leis 1972). The overall effect is that the composition of a local group fluctuates because men change residence before mariage and women change residence on marriage. However in the delta-coastal plain border area residence is patrilocal and only the woman moves on marriage.

b) Location of Settlements

The location of settlements is concerned with Trigger's (1968) third analytical level: the arrangement of communities within a particular geographic region. Niger delta settlements are located on three physio-topographic

features: solid ground in the mainland, solid 'islands' or higher levees, and unconsolidated mangrove swamps or lower levees.

i) Solid Land: Settlements on the solid land are found in areas around the fresh and saltwater zone which are free from any form of seasonal and tidal flooding. Interfluve and hilltop locations are found in the inner and more northern parts of the eastern delta where the high forest has been reduced by cultivation and provides good locations for settlement. Drinkable water is plentiful here.

ii) Higher Levees: In the freshwater zone a number of settlements are located on high levees which escape the annual flooding. Much further south within the saltwater zone along rivers and tidal creeks there are numerous solid 'islands' and sandy beaches which are suitable for settlement. These have been the focus of early settlements (oral tradition) and the locations of present day urban and semi-urban centres such as Buguma, Degema, Brass, Bonny and Okrika.

iii) Lower Levees: Within the saltwater zone there is a constant accumulation of fresh sediments and debris brought by each tide and ebb. These young, unconsolidated, muddy islands, which are in fact swamps, are however stable enough to support buildings and consequently offer temporary settlement sites for fishermen. These have retained the attraction of fishing ports, and of all the settlement patterns identified in the course of the fieldwork, the lower levee settlements were the most dynamic, their population being in a steady state of flux, their layout most subject to change. Their singular attraction rests in the main on their close proximity to the fishing grounds. Their structural layouts range from one to twenty huts each occupied by one to ten people belonging to a single family.

c) Determinants of Settlement Patterns

The physical pattern discussed in the earlier parts of this chapter may be said to have decided where settlements were placed and, with the social as well as the economic systems is responsible for the settlement patterns observed in the delta today. Floyd (1969) considered defence and sufficient land of good quality for adequate subsistence as the two cardinal considerations in the choice of settlement areas in the mainland borders of the delta. However beyond the military and economic there are some other factors which have been at play in the choice of settlement sites as a world phenomenon.

Ground water supply (drinkable water) has often been held to be a determining factor in the location of settlements (Karmon 1966). Field studies in 1976-77 have revealed that nowhere in the saltwater zone is there a source of drinkable ground water. The amount and duration of rainfall would seem to be adequate for meeting the people's fresh water needs. It is no wonder therefore that a permanent source of running fresh water would not be primary in settlement decisions. In the mainland and freshwater zones of the delta the few freshwater streams that occur have not attracted settlements. In fact throughout the entire eastern delta as in eastern Nigeria, ground water supply appears to be a negligible factor in settlement decisions (Niven 1954; Floyd 1969; Udo 1963). There has been a tendency to avoid river

banks and valley bottoms as the already noted low population density in the Niger delta, Orashi, Imo, Kwa-Ibo and Cross Rivers shows (Floyd 1969). This trend seems to have been set by experience over the years because running water is seen as a source of disasters in flood season, as health risks because standing pools harbour more mosquitoes and harmful insects and the fear of rivers as the abode of the gods.

A second constraint in settlement location can be security from predators—human and animal. Although it is not known to what extent defence against humans was of importance before A. D. 1400 it may be assumed to have occupied a more central place in the second and third stages of delta development, Dense forests were important in the mainland and freshwater zone defence systems and may have influenced settlement locations. Beyond defence the forests provided a variety of edible fruit resources and animals. This environment should have appealed to hunters and gatherers and to early cultivators too. In the saltwater zone the swamps offered protection in the same manner forests and hilltops did. The surrounding creeks and streams made them even more impregnable. In the 19th century records of internecine warfare are described. De Cardi (1899:492) for example, mentions the destruction of one 'state' by another, the withdrawal of some to inaccessible positions and/or the splitting into smaller units, as was the case in New Calabar into Buguma and Abomena in 1882; and the restreat of Jaja from Bonny to found Opobo (Alagoa 1972). All these emphasize the primacy of defence in settlement locations.

In terms of settlement patterns it would be expected that the need for defence went along with nucleation of settlements while peaceful conditions often had the reverse effect. It is very misleading however to think in terms of 'nucleation' or 'dispersion' about settlement patterns in the saltwater zone because available solid ground and the nature of such ground plays a greater part on the size and pattern of settlements than any other factor and probably has always done so. This situation does not obtain in the hinterland and the observation in the field in 1976 shows that because large expanses of land are available and because of relative peace and freedom from fear of raids, dispersion of settlements is now a feature of the landscape. Nucleation is equally on the increase but is a result of urban agglomerative tendencies brought about by government development plans.

It is obvious when considered together with the environment and the distribution of resources, that in the location of settlements, the economic constraints appear to be over-riding in the settlement pattern of the delta.

d) Settlement and Land Use

The relationship between settlements and the resource potentials of their immediate location is important to the understanding of the constraints in settlement patterns. The modern examples used for the illustration below show that each settlement is located within an area of assured source of food supply whether the actual resources are procured by cultivation, fishing, collecting or even hunting/trapping. The actual relation of the archaeological sites to the resources in the form of Site Catchment Analysis is studied in Chapter VII.

i) Mainland: In illustrating land-use patterns on the mainland our example is taken from Umuocham Aba, a village some seventy kilometres north of Port Harcourt. (Refer to Figure IV. 2.) This is a subsistence-agriculture oriented community, using the short (5 year) fallow system of cultivation. The location of houses is such that all the village land is within easy reach. Notice also the absence of any source of water supply within the locality. Every part of the territory is of use at some given time (as will be shown in Chapter VII). Reference may also be made to the discussion on Ogida Obibi (Chapter VIII) where yams are grown. It is clear from the location of Umuocham that cultivable land is of paramount consideration although the defence advantages offered by the forest cannot be underestimated. One interesting feature of this site, and of similar mainland locations, is the maze of footpaths that crisscross the settlements and also connect them with others. This is brought out more clearly in Figure IV. 3 below. Contrast also the dispersed settlement with say that of Atako village in Figure IV. 4 below (Morgan 1955).

ii) Mainland-Saltwater Zone Borderlands: Settlements in this zone combine mainland and marine characteristics. They include the Diobo villages around Port Harcourt, Alaocha, Okochiri. Attention will be paid here to eastern Diobo settlement and its land use (Figure IV. 3). The land classification is similar to that in the mainland proper but the presence of swamps and creeks introduces new elements into the land use pattern. The fallow system here uses longer periods between cropping sessions while in the Umuocham village fallow is reduced to about five years at the maximum.

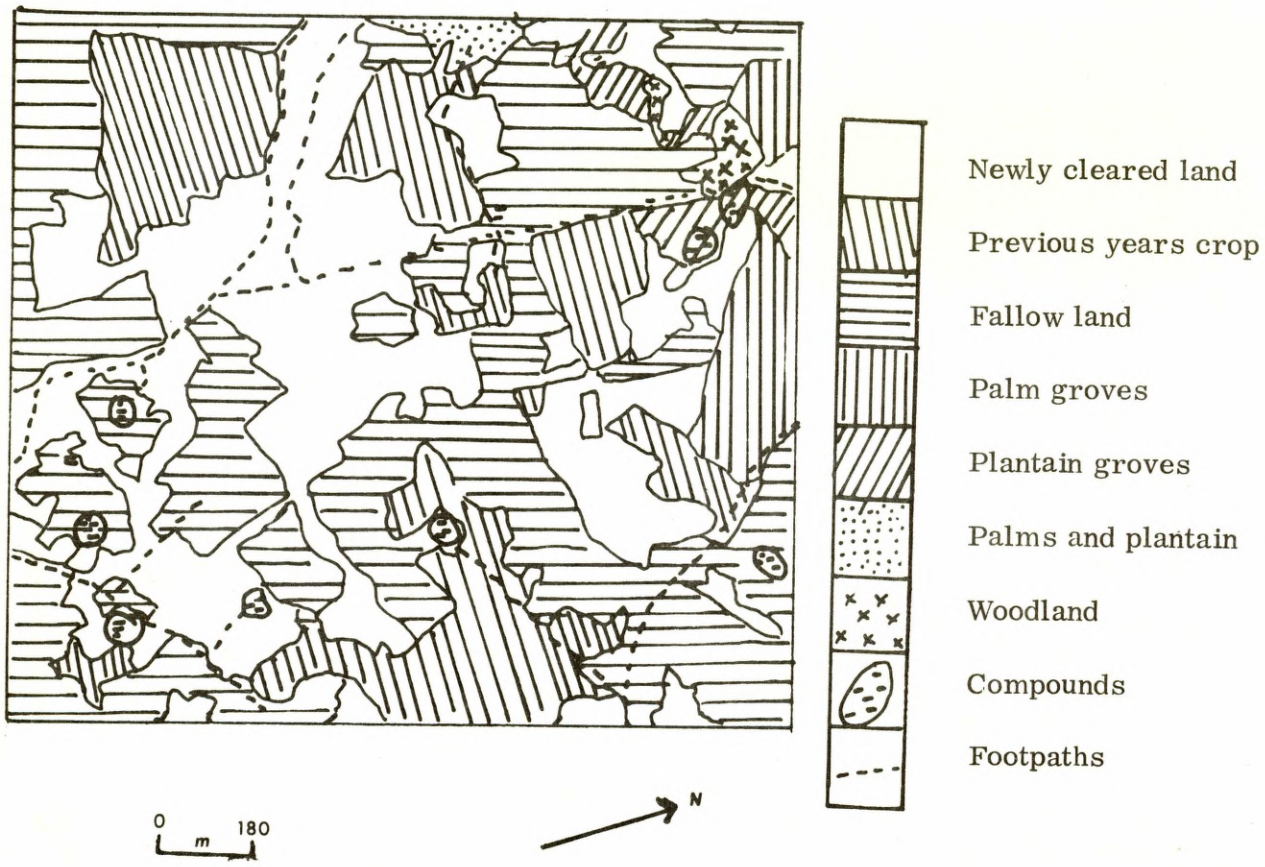
A clearer picture of the land use in Atako village is shown in Figure IV. 4. The land classes are similar to Umuocham's but the settlement is much more concentrated although the sub-concentrations have greater intervals between one and another. Notice the maze of footpaths that traverse the length and breadth of the farmlands and from the houses (Fig. IV. 3) and lead also to different parts of the creek (Fig. IV. 4) thereby offering access to marine resources. The position of fish traps along the creeks is also of some interest in the exploitation of the creeks and in the same way the swamps are exploited for shellfish and crabs.

iii) Saltwater Zone: Part of the discussion on the Diobo settlement and land use gives an understanding of the exploitation of the creeks. Apart from the urban centres which occupy the solid grounds (islands) for instance Buguma, Degema and Okrika, the saltwater settlements are all creek settlements. Location of settlements appears to be concentrated only along sheltered creek banks wherever there is ample solid or consolidating ground: the rule seems therefore the avoidance of large rivers and open seas. This is also true for the location of the early settlements, for instance Ke, Saikiripogu (Ewoama) and even Nembe, the daughter settlement of Onyoma (see Figs. IV. 5, 6, 7).

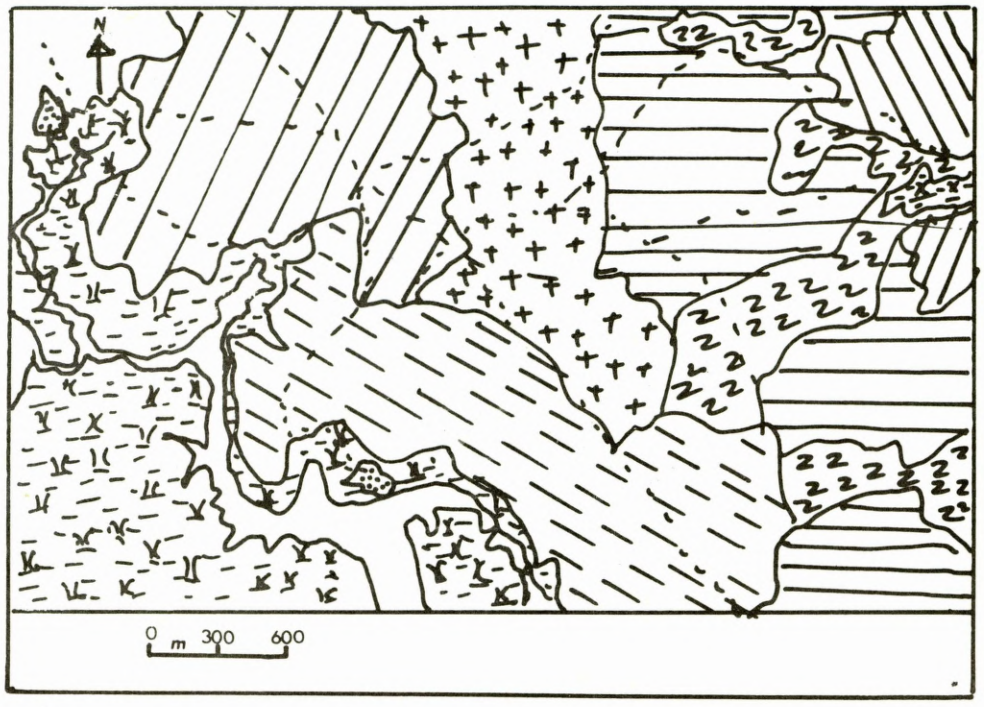
In Figure IV. 5, Ke, which is the major settlement, is located on the sheltered corner of Ke creek where it exploits the forest resources to the east, the muddy and mangrove swamps to the north and south and the fish resources by the creeks.

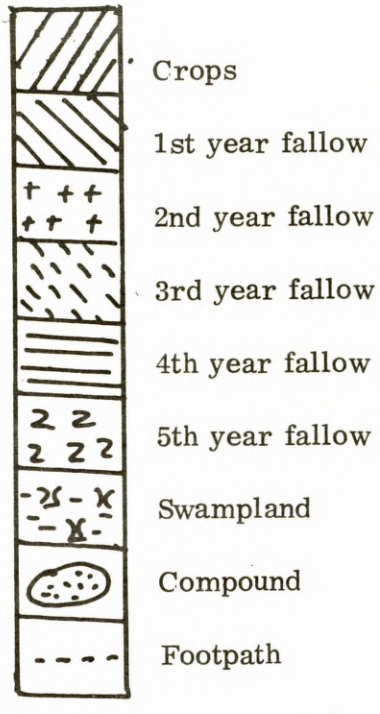
The location of Nembe, Fig. IV. 6, at the head of the saltwater is strategic for its nearness to the freshwater resources immediately to its north and

Figure IV. 2 Settlement and Land Use in Umuocham Aba




(Adapted from Morgan 1955)



Crops

1st year fallow

2nd year fallow

3rd year fallow

4th year fallow

5th year fallow

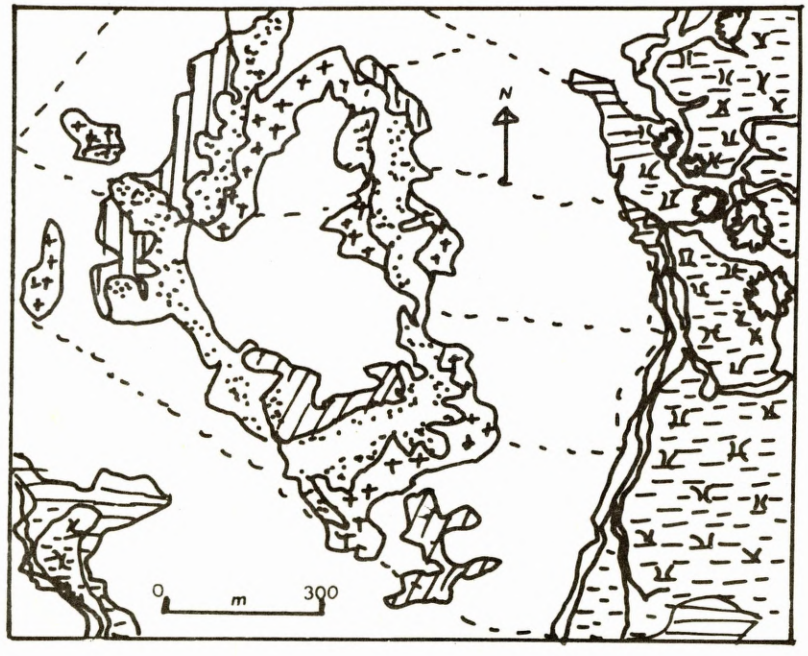
Swampland

Compound

Footpath

(Modified from Morgan 1955)

Figure IV. 3 Settlement and Land Use in Eastern Diobu




Palms and plantains

Palm bush

Reduced forest

Plantains

Swampland

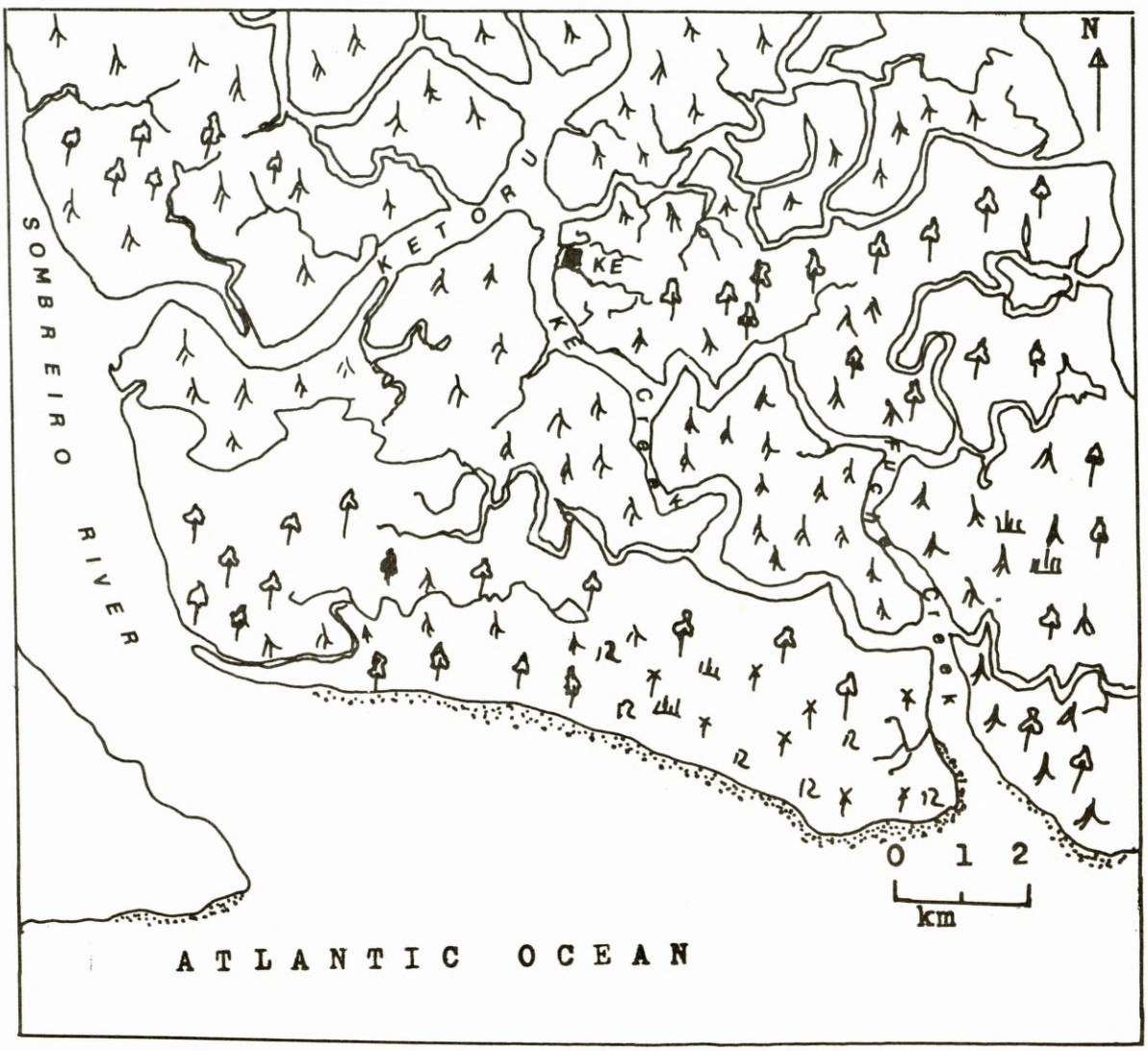
Compounds

Fish traps

Footpaths

(Modified from Morgan 1955)

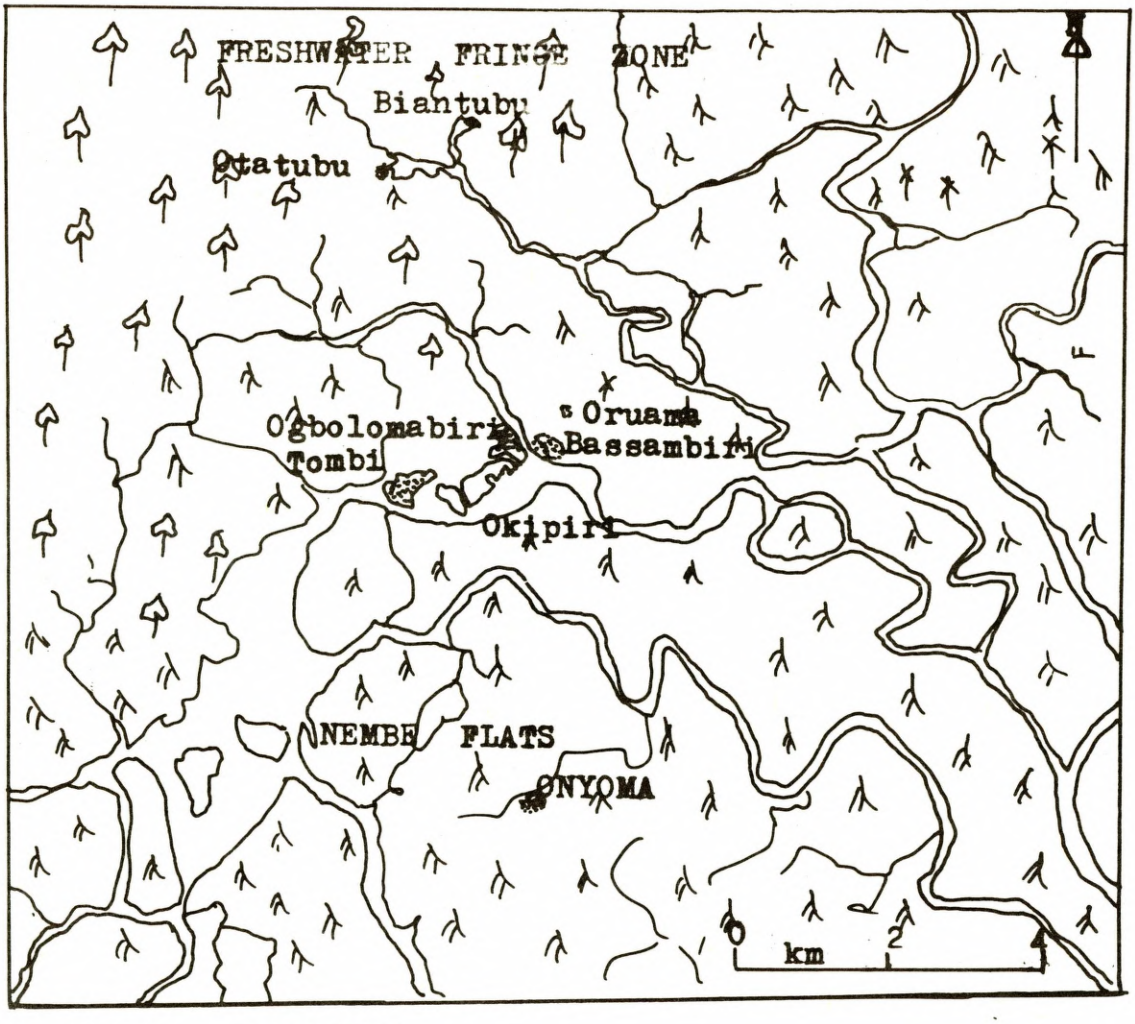
Figure IV. 4 Settlement and Land Use in Atako, Diobu




Legend for Figures IV. 5-IV. 7

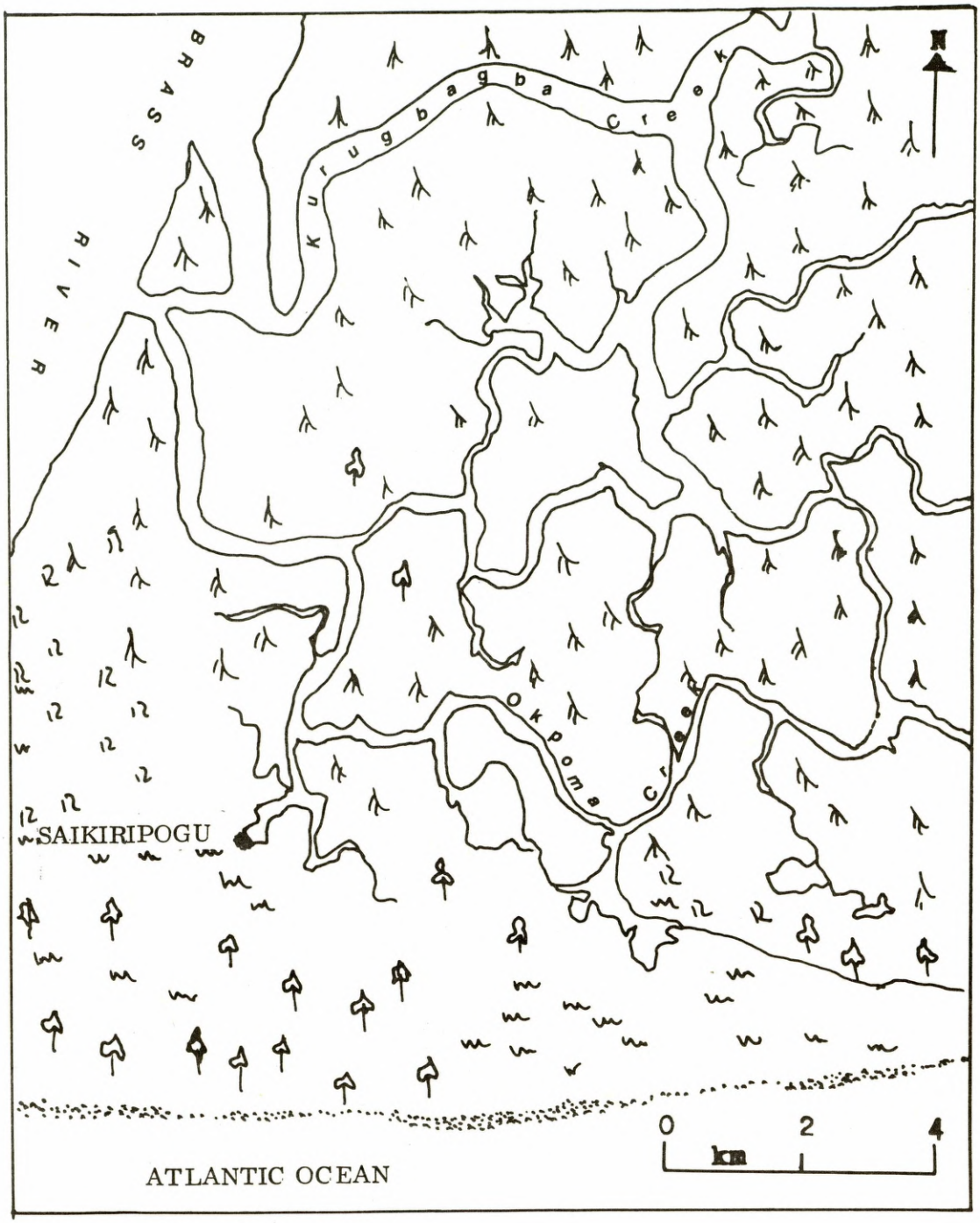
- Mangrove Swamp
- Orchard Bush
- Palms
- Cultivation
- Marsh
- Forest
- Sandy beach
- Rivers/Creeks

Figure IV. 5 Resource Zones in the Sombreiro-New Calabar Rivers Area. (Note the location of Ke in a sheltered creekside.) Refer to Figure VII. 3.




For legend see Figure IV. 5

Figure IV. 6 Resource Zones in the Upper Brass River (Note the location of Onyoma in the periwinkle-rich Nembe Flats.) Refer also to Figure VII. 1.




For Legend see Figure IV. 5

Figure IV. 7 Resource Zones in the Brass-St. Nicholas Rivers Arc. (Note the location of Saikiripogu (Ewoama) at the northern edge of the Sandy beach ridge.) Refer also to Figure VII. 2.

far west. The oil and raffia palm trees of this region provide edible oil and local beer which can be distilled. The Nembe flats are muddy periwinkle beds which are known to be very prolific.

Further south of Nembe is the location of Saikiripogu (Ewoama) very close to the open sea (Fig. IV.7). Saikiripogu is located not on the Brass River, nor on the Atlantic front but in a sheltered zone at the tip of a quiet creek. Like the other sites it exploits the rich fish resources of the creeks and could if it had the technology venture into the near shore or even on the Brass River for bigger fish. However, by assuming a location on the sheltered sandy beach of which Brass is part, Saikiripogu has the forest and sandy beach resources as well as the marsh, mangrove swamp.

For the modern settlements in the three zones of the delta a predictive pattern of settlement for earlier periods may be suggested.

1. Pre-farming

   a) Mainland: Hunting and gathering groups in the thick forest.
   b) Freshwater zone: As at present but mobile groups also exploiting river resources.
   c) Saltwater zone: As at present but mobile if boats were known. Otherwise restricted to edge zones only.

2. Early Farming (Pre-European)

   a) Mainland: Possible some surviving hunting/gathering groups. Farming settlements as at present, settled communities.
   b) Freshwater zone: As at present, settled communities.
   c) Saltwater zone: As at present settled communities, although new settlements came into being with movement of people into the zone.

3. Later Farming (15th-19th Centuries A.D.)

   a) Mainland: More concentration on defensive sites and construction of defensive structures.
   b) Freshwater zones: More concentration on defensive sites.
   c) Saltwater zone: More concentration on defensive sites. Abandonment of exposed and easily threatened sites.

# PART II

# THE ARCHAEOLOGY OF THE EAST NIGER DELTA

# CHAPTER V

# FIELD SURVEYS AND SHELL MIDDEN EXCAVATIONS

## INTRODUCTION

In southeastern Nigeria six broad archaeological zones can be isolated for study on the basis of ecological divisions. These are the Cross River Valley, the northern plateau, the central and southern scarplands, the Anambra Valley, the coastal lowland plains and the Niger delta. This subdivision is illustrated by Figs. V. 1, V. 2. This division is for convenience of research and may not always have equated with cultural divisions. However, the discussion on the fieldwork of 1976 and 1977 is confined to the Niger delta while a general discussion of work in other parts of eastern Nigeria has been given elsewhere (Nzewunwa 1979:394-418).

In order to recover the data required by the nature of our investigation, archaeological field study was conducted at three levels: 1) the regional level, herein referred to as the Niger delta; 2) the zonal level in which the Niger delta was divided into three zones—the freshwater zone, the saltwater/ sandy beach zone and the mainland edge zone; 3) the site level. On a regional level sites in all the three zones were studied and those excavated (between 1973 and 1976) were re-evaluated in terms of the midden contents (column samples); their site potentials and catchment analysis studied. Similarly contemporary ethnographical information, economic and socio-cultural information was also collected. This had aided our reconstruction in Chapters VI-IX. On the zonal level, the Bonny-Okrika Rivers area was chosen for detailed study (Fig. V. 3). This involved the study of contemporary settlements on the island of Okrika, the fishing ports and the mainland fringe. On the site level intensive surface collection and subsequent experimental shell midden excavation and analysis were carried out at Okochiri and comparative materials were collected from Onyoma, Saikiripogu, Ke, Ogoloma, Alaocha, and Okrika.

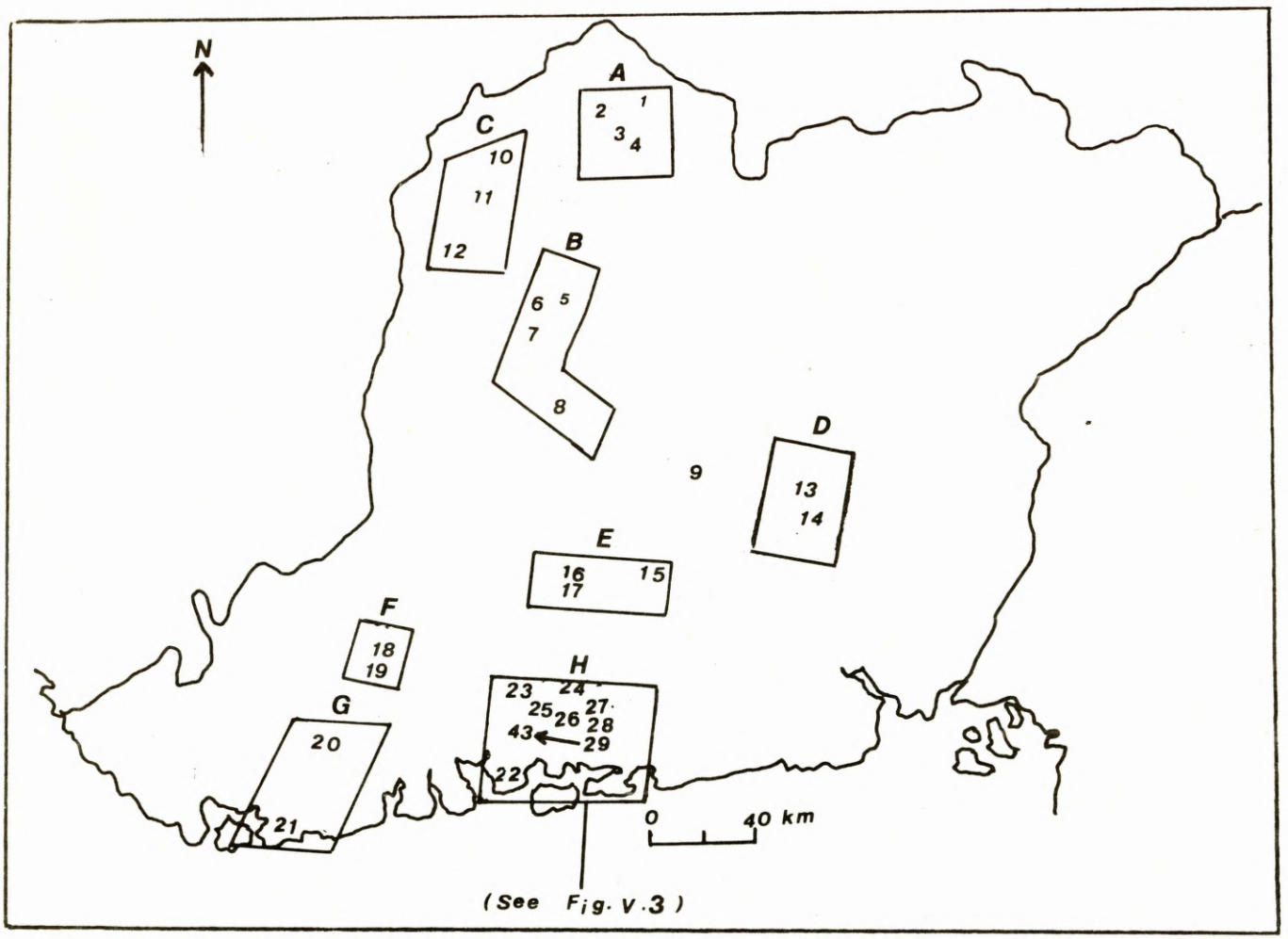
The presentation below is concerned with the nature of the Niger Delta archaeological sites (F, G, H, on Figure V. 1), their formation and characteristics. A separate section covers experimental midden excavation,

## 1. Sites and Features

### Site Definitions

An archaeological site is here defined functionally and/or structurally as a place with traces of human occupation there by implying past human activity. Ragir (1972) adds new dimension to this definition when she includes the nature of the recoverable data. Thus an archaeological site becomes "accumulations of materials which are the residues of cultural activity [which]... can provide both qualitative and quantitative information about the activities, ecology, and

Figure V. 1 Glossary of Sites in Eastern Nigeria (Numbers indicate approximate location of site)




A Northern Plateau
B Central and Southern scarplands
C Anambra Valley
D Cross River Valley
E Central Lowland
F Freshwater
G Saltwater/Sandy Beach
H Okrika-Bonny River

| Group | No. | Site | Group | No. | Site |
|---|---|---|---|---|---|
| A | 1. | Umundu X | H | 22. | Ke X |
| | 2. | Isiugwu Obukpa X | | 23. | Elekahia |
| | 3. | Nsukka University FarmX | | 24. | Eleme |
| | 4. | Okpe Igara X | | 25. | Alaocha |
| B | 5. | Ezira X | | 26. | Okochiri X |
| | 6. | Enugu ukwu X | | 27. | Onne |
| | 7. | Igboukwu X | | 28. | Ogu |
| | 8. | Alike X | | 29. | Owuogono |
| | 9. | Etiti Ulo X | | 30. | Iyokiri |
| C | 10. | Ogurugu | | 31. | Semenibikiri II |
| | 11. | Umueje | | 32. | Kiriam |
| | 12. | Umu X | | 33. | Mgbemgbebikiri |
| D | 13. | Ukpa X | | 34. | Semenibikiri I |
| | 14. | Afikpo X | | 35. | Owuamobobikiri |
| E | 15. | Afaha Obong X | | 36. | Olobikiri |
| | 16. | Awaka | | 37. | Dawes Island |
| | 17. | Ogida | | 38. | Sara |
| F | 18. | Omagbele | | 39. | Dikibotarasinga |
| | 19. | Ekudem | | 40. | Trapukiri |
| G | 20. | Onyoma X | | 41. | Akainkoroma |
| | 21. | Saikiripogu X | | 42. | Ogoloma X |
| | | | | 43. | Ilachinga |

X = Excavated site

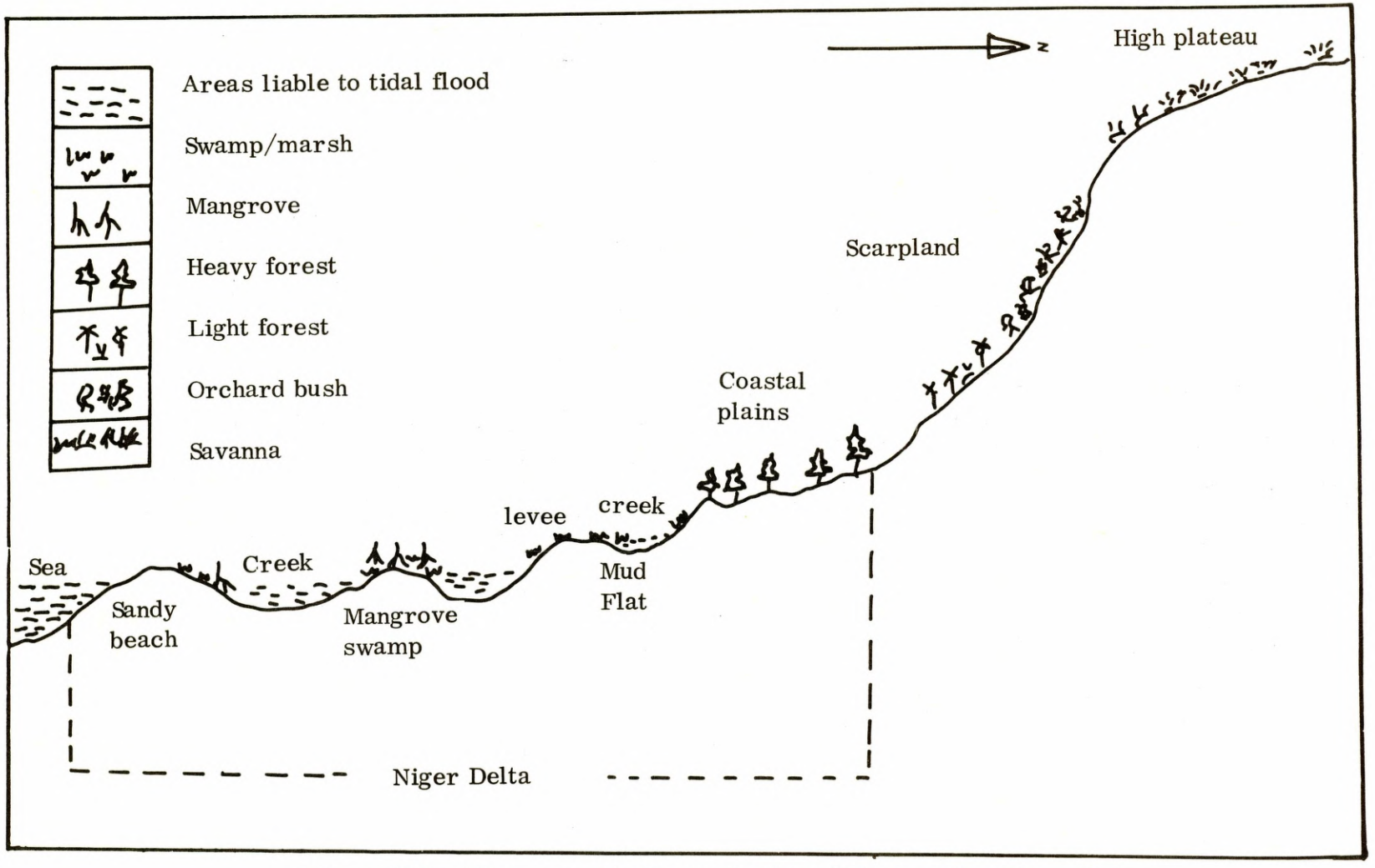
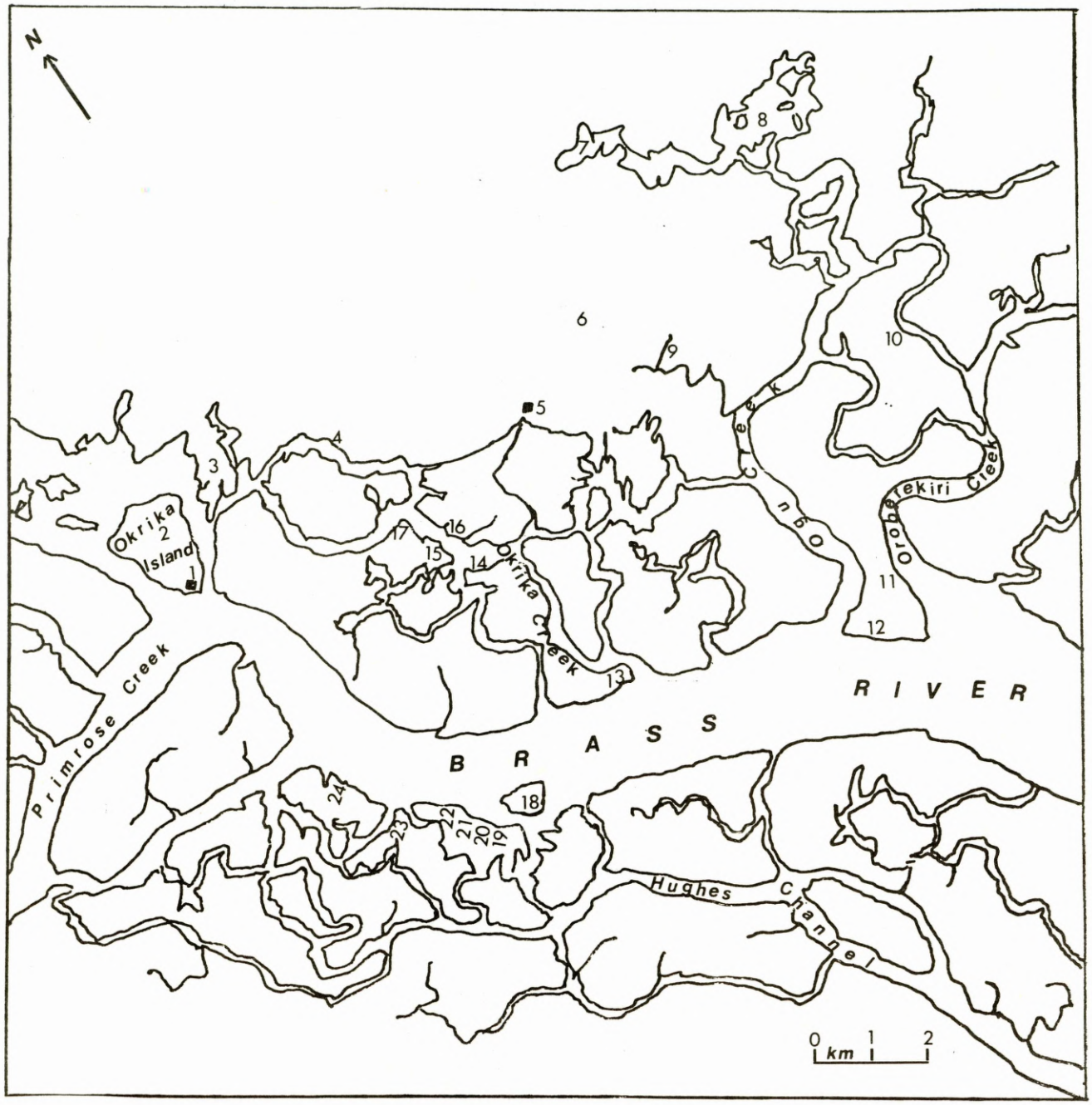



Figure V. 2 Diagrammatic Cross Section of Eastern Nigeria

Figure V. 3 The Okrika-Bonny Rivers Area. (The numbers indicate approximate locations)




1. Ogoloma
2. Ilachinga
3. Ibuluya
4. Alaocha
5. Okochiri
6. Onne
7. Wakana
8. Ogu
9. Ele
10. Mawe Fishing Camp
11. Owuogono
12. Otobiri
13. Semembikiri II
14. Kiriam
15. Mgbemgbebobokiri
16. Semembikiri I
17. Iyokiri
18. Dawes Island
19. Owuamobokiri
20. Sara
21. Anderekiri
22. Dikibotarasinga
23. Tarapukiri
24. Akainkoroma

cultural and chronological relationships of the human occupants of the site" (1972: 178). Sites may be classified in numerous ways (Alexander 1970) although these have been grouped according to the activities that take place in the sites (Knudson 1978). In our study area while it is easy to designate as separate sites widely separated archaeological features it is not always clear when separated by, say, fifty metres. Here they have been listed separately if they are 100 metres apart or if there is sufficient manifestation of cultural difference or chronological separation.

Most sites in south eastern Nigeria have been designated by the name of nearby modern settlements or their inhabitants. The problem in using a simple place name comes when a survey of this nature locates a number of sites markedly different in structure, age and function in a given place. To avoid ambiguity, the present study combined place name and numerical designation using descriptive and illustrative appendices for such names when necessary.

Field Methods

The surveys made extensive use of air photographs (St. Joseph 1966) not for locating sites but for isolating specific soil, vegetation and climatic situations and agricultural field systems worthy of study.

The 1:40,000 scale air surveys flown for Federal Surveys Lagos Nigeria by Canadian Aero-Service Ltd. were used. Dense forest rendered them useless in locating archaeological sites. The photographs were used with the fifteen-minute grid 1:50,000, 1:100,000 maps of Nigeria Federal Surveys and the 1:2500 state maps.

Ground observations were made by walking in inland zones and by the motor boat or hand-paddle dugout for the coastal and riverine areas. In situations where time and distance measurements were required the hand-paddle dugout, the traditional mode of transport in the delta, was utilized.

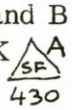
Because of the nature of the vegetation in much of the southern half of the study area it may be assumed that a number of sites could not be located since they must have been buried under leaves and other rotten vegetable matter. Most of the sites which were found showed up during the cropping season in areas where the ground had been cleared, burnt and hoed. This is a period of about five months in each year and because of the fallow system of cultivation the ground soon reverts to mature vegetation. It is also noted that because the hoe does not till deep into the soil, some buried sites may not be exposed during the cropping season. In the more northern parts of the study area where the vegetation cover is lighter, it was easier to locate sites.

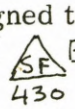
Middens

Sites were mostly located by mounds (middens). No dwellings or other structures have yet been located. Where a site was found the usual practice after a survey was to walk over it picking the sherds or shells and any other material manifested on the site. Their positions were noted on the site plan. Pottery was the main indicator on most site surfaces. Shells were collected for identification.

Sherd finds ranged from fifty to hundreds per site. These were either analyzed on the site, at a base camp, or in the laboratory. They were catalogued, drawn, measured, described and the information was stored on pottery analysis forms designed for the purpose (see Chapter IX).

The system of numbering and cataloguing designed for the survey stored three major information sets—the name of the site abbreviated to two capital letters, the nature of the find, SF indicating it a surface find and the number assigned to the artefacts, e.g. OK 

A further advantage of the triangle storage design is that it allows for further information on the artefact. For instance, where two mounds A and B were assigned to a single site their finds could be differentiated thus OK 

, OK 

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Certain sites in the Bonny-Okrika complex were under high tide when visited. It would appear that such sites, eroded by the constant ebb and flow, have been buried by successive silt deposits with each tidal phase. There is no doubt that many sites of archaeological interest have been washed away by tidal currents and redeposited in entirely new areas.

It would follow that surface indications on the site are not a complete representation of the actual size of the individual sites because of differential destruction, redeposition, concealment and other factors at work in different sites. In the same way the size of an individual site is an unreliable indicator of the length of its occupation. For shell midden sites estimates of these were possible using chronological and quantitative data that have proved amenable to such calculations.

The lack of well stratified sites and surface finds which do not exhibit marked variety or pronounced frequency made it difficult to discern site variety within such microzones as the saltwater, freshwater and mainland. The data show signs of difference between these microzones but no clear pattern of difference within the microzone. The surface finds show a tendency for cultural continuity but no chronological inference was apparent from the finds. Beyond the immediate microzone it is found that the materials cut across wide areas with substantial stability. Neither the potsherds nor the shells were of immediate assistance in establishing the age and importance of a site. It was complicated by the fact that no pottery sequence had yet been established for the study area.

Midden Accumulation, Structure and Destruction

Niger delta shell middens accumulate as refuse middens resulting from food wastes. The reconstruction given below is the result of local information and observation in the field. The settlements are located at the banks of creeks and rivers and huts are usually built as close as 50 metres from the creek, some in fact less. Three trends seem to have been followed in throwing away household refuse. The first is to throw it into creeklets from which seawater reaches the habitation during high tide, thus checking the ingress of tidal waters. The second method is to throw the refuse into a ditch or pool to raise the ground surface or to reclaim swamp land and consolidate its base. The third is to throw the communal household refuse into a part of the ground on which no structures were erected. These methods by which mounds are brought into being at different sections of a settlement account also for the shape of the midden.

a) Creek Midden

In the first type of midden (Fig. V.4) the terrain slopes towards the creek and accumulation of domestic refuse invariably follows the pattern of the terrain. The ebb and flow of the tides determines the shape of the midden. The tendency is for the refuse to drop into the creek (Fig. IV.4b) even as a result of gravitation or wind action or it may be brought down by tidal current at high tide (Fig. IV.4, c, d). With time, however, the midden stabilizes and becomes able to withstand tidal current or wind action. It is only then accumulation above water level is possible (Fig, V.4e, f). The final shape of the midden can be anything from Fig. V.4c-f depending on the length of time the settlement was occupied and the quantity of domestic refuse deposited, as well as the strength of the tidal currents. In the same manner its destruction depends upon the strength of the tidal currents and the rate of its consolidation assuming that man does not tamper with its shape.

b) Ditch Midden

The second type of midden may accumulate in a pool or ditch which may be filled with water at high tide or contain substantial amounts of water when the tide is out because it is below the water table. The need to fill this pool may be to reclaim the land, or to bury the refuse or even to reduce its potential as a hazard area because people might accidentally fall into it.

The external structure of the ditch midden depends upon the shape of the ditch but a convex bottom shape has been assumed in Fig. V.5. In most cases the ditch midden is a flat topped ellipse (Fig. V.5b and 5c). In an extreme case the midden shape could be winged (Fig. V.5d). Destruction of this midden type by tidal current is not possible except in the final stage (Fig. V.5) when the midden sprawls on both sides above tidal water mark. It becomes subject to creek erosion on the creekward side.

c) Flat-ground Midden

This third type of midden forms near the settlement or flat land. It could be very close to the residence or away from it but hardly further away than twenty metres. It forms from the accumulation of domestic refuse on open flat ground. These middens with time assume the shape of a truncated cone, and sprawl on all sides as more and more refuse is thrown into them. Figure V.6b or d illustrate the development of this type of midden. Its destruction is usually through the action of man although wind and rain help to reduce the peak.

Midden Stratigraphy and Chronology

Apart from the general patterns in their deposition, accumulation and their final shape it is worth considering the general characteristics of the internal midden profile within the period when it is in use by a group. Although natural agencies such as the wind, rain and creek erosion and tidal currents subject some mounds to varying sizes from time to time, thereby altering their stratigraphic profile; man has also largely contributed to this alteration which is of interest in midden archaeology.

In the Niger delta as indeed all over eastern Nigeria the general practice is to throw domestic and other compound refuse into a pit which with time grows

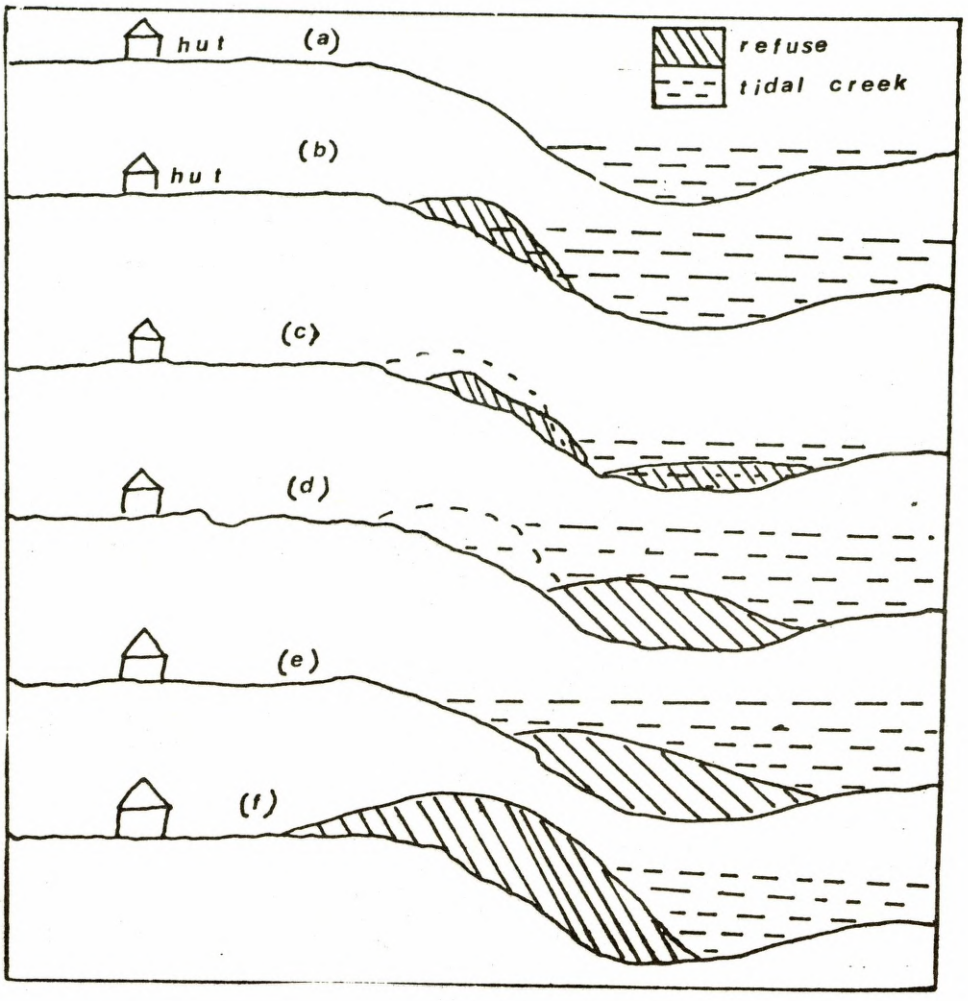



Figure V. 4 Creek Midden Formation

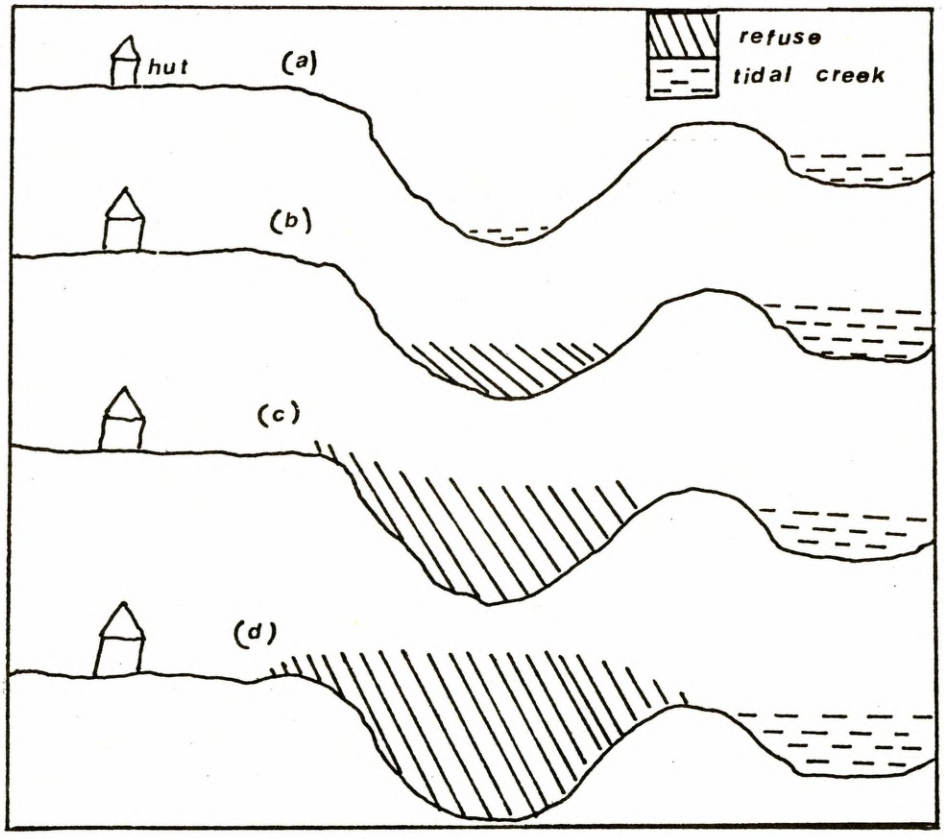



Figure V. 5 Ditch Midden Formation

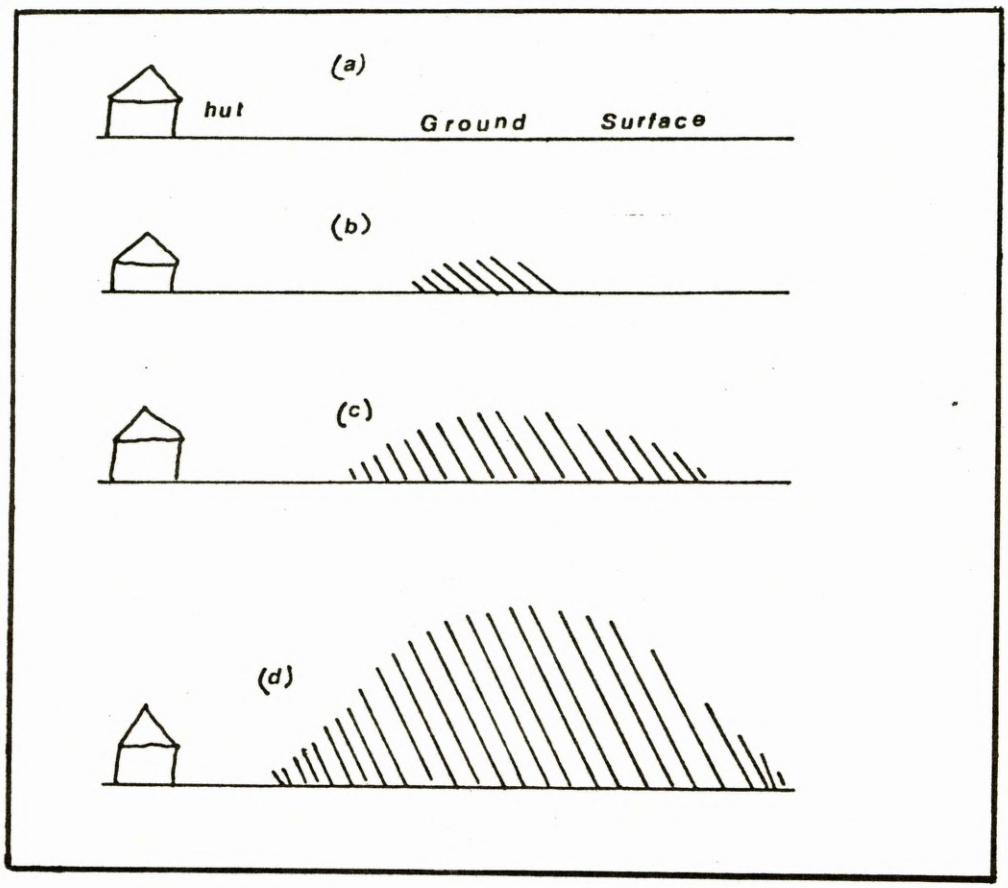



Figure V.6 Flat Ground Midden Formation

into a mound. In order to ensure that the pit or refuse dump continues to serve this purpose the refuse is from time to time shovelled from a higher to lower section thereby reducing the size of the midden. In other cases the refuse is first subjected to firing which burns out some of the organic matter before it is thrown from one section into another.

The result of these refuse-management activities for archaeology is that stratigraphy is disturbed as material is redeposited from a primary to a secondary area. The final midden size and shape are also affected. The chronological implication must be considered in any situation where this practice seems to have been used. And the midden archaeologist must bear this in mind when interpreting stratigraphic observation. In collecting datable samples such as charred wood there is the possibility that the turning of midden refuse before and after firing may bring about a distortion in the age of organic matter being collected. What is more, there is an equal possibility that fresh wood burnt at the time of midden firing and thrown into lower stratigraphic levels of the midden may turn out dates that are younger than those from levels above it. Because shell midden stratigraphies are hard to recognise, this situation becomes even more complicated.

Another fact to be taken into consideration in seeking the oldest dates for a midden is the area of initial deposition. This may more easily be found out if one can locate the huts from which refuse was thrown into the middens. Observation of contemporary practices shows that the oldest deposits are more likely to be at points on the old ground surface nearer to the hut than at the bottom of the point of greatest depth. Unfortunately archaeologists are usually attracted to the highest section of the midden which is expected to produce more stratigraphic variations and possibly more qualitative economic and cultural data. Experience at Okochiri midden excavations (see below) shows that although the periphery of these middens may not be deep they may hold the key to the chronological understanding of midden composition and characteristics (see Stratigraphy Midden A, OK I, OK II below).

## 2. EXPERIMENTAL EXCAVATIONS OF SHELL MIDDENS: OKOCHIRI 1976/77

### The Site Location

Okochiri lies at a point $7^{o}$ 08' East and $4^{o}$ 42' North. It is some 6.5 km aerially southeast of Okrika or some 8.5 km by water from Okrika Island, 15 km southeast of Port Harcourt and 3.5 km southwest of Onne. It shares boundaries with Eleme the immediate northern neighbour. Okochiri is accessible by water through Oko Toro or by footpath across Alaocha from Okrika mainland and by motor vehicle through Onne (motorable at times) (Fig. V.3).

Okochiri is said to be the oldest mainland settlement of the present people of Okrika and the present generation call it Olomu Ama (old town). Migrations leading to the peopling of Okrika Island are said to have taken place from Okochiri but the site is still inhabited by a number of people that fluctuates between eight and fifteen at any given period, the constant features of the population being children of primary school age.

Okochiri enjoys a dry upland environment being located on the southern tip of the coastal lowland plains. It stands over 15 metres above Oko Toro water

Figure V.7

EXCAVATIONS AT OKOCHIRI 1976-1977

OKOCHIRI SITE PLAN

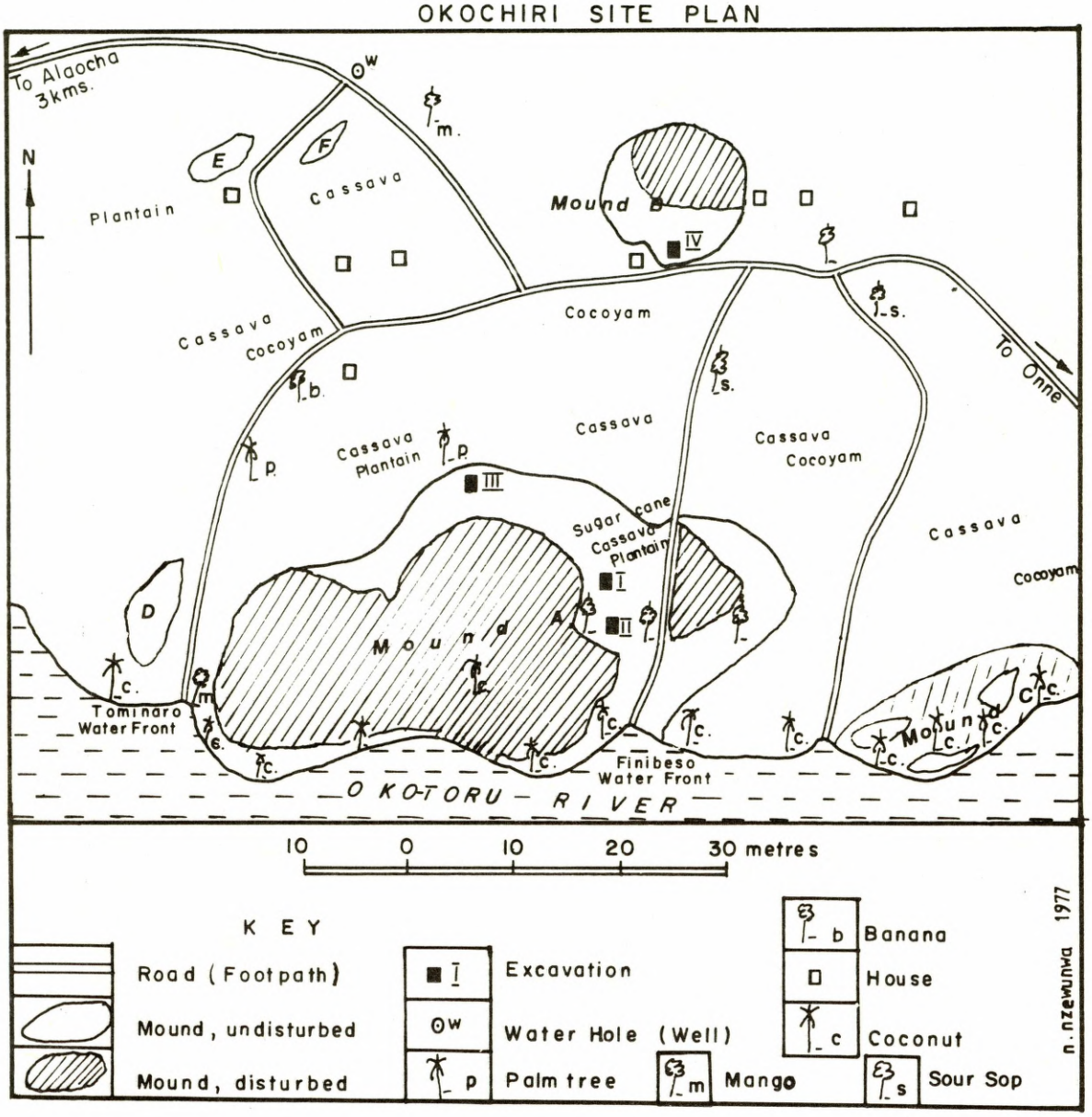


table at high tide. Two sharp seaward sloping footpaths run from the settlement across sections of the mound complex towards the river (Fig. V.7), the Tominaro waterfront footpath cutting the major mound (mound A) into two parts.

Oko Toro (Oko river) is a tidal river on the south and southwestern margins of the site which enters the Okrika creek to empty into the Bonny River further south. So much economic activity goes on along these rivers and creeks that while Okochiri may be situated on the dge of the mainland it is riverine in its social and economic orientation. The river can be crossed on foot at low tide. Beyond the river are mud flats and mangrove swamps. The northern banks at low tide expose a five metre vertical section of red clay which continues to give way as further river and rainwater erosion cut through the banks.

The vegetation has been drastically modified by continous habitation and exploitation. Along the water edge on the mainland side evidence of habitation and ecological modification is borne out by the continuous line of coconut trees with very light undergrowth on shell debris. A number of domesticated and protected plants abound—African pear, African breadfruit, the raffia and oil palms, udara, which tower high into the sky in the struggle to reach sunlight. From a distance this canopy which has developed appears black and misty but is dark and cool underneath.

While the coconut trees line the waterfront the oil palm trees dominate the inland landscape, the latter are regularly tapped for palm oil while the former are left to ripen and hardly harvested except when coconuts fall. Fruit trees like guava, pawpaw, sour chop, oranges are also part of the present landscape. There are numerous stands of plantains and bananas while on compound gardens cassava, pepper, okro are planted. There are very few stands of yam but yam cultivation is a feature of the life of their immediate northern neighbours. Cocoyams are also planted in compound gardens. The relationship of these areas is set out in the site catchment analysis (Chapter VII).

Okochiri Shell Mounds

The Okochiri mound complex consists of two major mounds referred to here as A and B and six ancillary mounds, three within C; and D, E, F. Mound A, said to be the oldest, is closer to the waterfront and dips slightly southwest. In its original form it might have measured some 55 metres east to west and 32 metres north to south giving a base area of about 1760 square metres in the central portion. Its height may have been some five metres of accumulation from the old ground surface. An auxiliary mound (C) sprawls along the bank of Oko river for some quarter of a kilometre, but soundings during column sample collection, would suggest that its depth does not go beyond thirty centimetres in most places, rising no more than fifty centimetres above the present land surface. Its total surface area is about 580 square metres.

Mound B is (see Fig. V.7) situated about 40 metres north of mound A and rises to a height of about 4 metres above the old ground surface with a diameter of some thirty metres. It is smaller than mound A though on a higher ground.

While mound A is a segment of a sphere, mound B is a truncated cone. Both have suffered from some form of extensive quarrying. Mound A is still being actively quarried by builders carrying canoe loads to the island of Okrika to reclaim land or consolidate house foundations and house floors. Mound B

was extensively excavated for raw material to support a lime industry which is now defunct.

Choice of Excavation Sites

The choice of Okochiri for excavation after survey rested on four factors. The first was the evidence of oral and written sources which recorded it as a place of early settlement for a community now totally marine-oriented and insular in outlook; secondly the present community on the site, who live in the traditional way, offers a unique ethnographic opportunity for archaeological analogy. Thirdly Okochiri offered an opportunity to study the interplay of man and several environments, being located at the junction of varied ecosystems with high potentials for different types of resource exploitation. Fourthly, being a shell midden site it offered the opportunity to experiment on shell midden analysis in West Africa.

Excavation Strategies

Excavation lasted from the 27th December 1976 to January 15th 1977. Dr. F. N. Anozie who had pioneered excavations in the Niger delta was present for three days during the excavations. The Museum staff of the Rivers State Cultural Centre and Mr. Tilleh who had worked with Prof. Connah supplied technical help while labour was also recruited for general duty. In all, eighteen people were involved with one stage or the other of the excavation.

Three 2 x 2 m areas designated OK I, OK II and OK III were opened in mound A while a fourth designated OK IV was opened in mound B. (See Fig. V.7.)

The excavation was limited in scope as it was intended mainly for shell midden analysis experiments. The stratigraphy and contents of shell middens in the delta are known from the work of Anozie (1973, 1976a) so that test excavations of this kind, as has since been recognized in the United States, in Australia and New Zealand (see Chapter VI) can fairly be regarded as a reliable technique of midden excavation. Column samples were collected from both excavated and non-excavated parts of the mounds to serve as checks in the exercise. Flotation techniques (Streuver 1968b) were also applied.

The pits were further sampled in different ways. OK I and OK II were excavated without any form of sieving while all of OK III and part of OK IV were dry- and wet-sieved. The results obtained in combination with the column samples seems to show that dry- and wet-sieving of all pits spit by spit would have been wasteful. Three mesh sizes of 25 mm, 12 mm and 4 mm were used in the field because the materials, especially shells were large. The availability of water close to the excavation facilitated the wet-sieving and washing of artefacts.

Because the shell middens have consolidated, pick axes were necessary in loosening the matrix. Trowels and shovels were later used for searching and collecting loose material. The site was exposed by stripping horizontally in 15 cm spits to allow for recording of soil colour, texture, the cultural and organic components. An attempt to open a small control pit 30 x 30 x 15 cm at the northeast corner of OK I and OK III did not prove successful because of the compact nature of the oyster shell lenses.

Stratigraphy

Midden A

The three areas excavated show definite similarities but will be discussed separately.

OK I was composed of three major strata: (Fig. V.8) the present top soil about 9 - 13 cm in thickness consisting of very friable dark humus in which the topmost 3 centimetres were of recently deposited trash, rubble and weeds, below which were few shells and rootlets; the intermediate stratum composed of compacted oyster shells intermingled with light brown clay which was sticky when wet varying in thickness from 26 to 63 cm in a west to east orientation; toward the east and south corner a lens of periwinkle shell in pale to dark brown soil about 9 cm thick was noted and three lenses of ash occurred in the east, west and north with associated charcoal.

The third stratum, and the closest to bedrock, was one of dark clayey soil mainly in the east, south and north sections which was about 7 cm thick, moist, with few associated shells. This was the pre-midden land surface.

Bedrock was a compact red clay which was sticky when wet, clodded easily and cracked when exposed to dehydration.

OK II. This area was similar to OK I in most respects and is separated from it by five metres. However, intact palm kernels occurred in the east from about 34 cm to 46 cm from the present land surface. Some at a depth of between 30 cm and 68 cm in the central portion of the pit bear noticeable teeth action and were undoubtedly disturbed by a rodent burrow (see Fig. V.9).

OK III. The stratigraphical sequence of OK I and OK II was repeated in OK III, but because OK III was the deepest sounding and because most of our analysis is based on it, its stratigraphy is discussed below in some detail (Fig. V.10).

a) Top Soil

This layer of dark loose soil may be split into two; the very thin topmost section about 3 cm thick with only weeds and no shells and below this and extending to a depth of about 26 cm from the surface, a lens of oyster shells with few rootlets. A hole-like sterile feature in the east section ran from top to a depth of 53 cm starting with a width of 61 cm and tapering to 30 cm at base. It seems a pit was made there and the soil removed before it was infilled.

b) Fine Sand Stratum

With a thickness of 10.7 cm this was sterile. The thickness suggests that the mound was not in use at the time and that strong erosional action possibly caused by rain and wind was responsible for depositing the fine white beach sand. This is a pointer to the fact that the rubbish dump was perhaps irregularly used and therefore the site was not continuously occupied. Of course the presence of alternative mounds in the vicinity and the fact that this sterile layer occurs late in the history of the mound may not strictly be interpreted as abandonment of the site but rather that this particular mound or part of it was not in use at the time the fine beach sand was deposited.

Figure V. 8. Sections of OK I (See Site Plan Fig. V. 7)

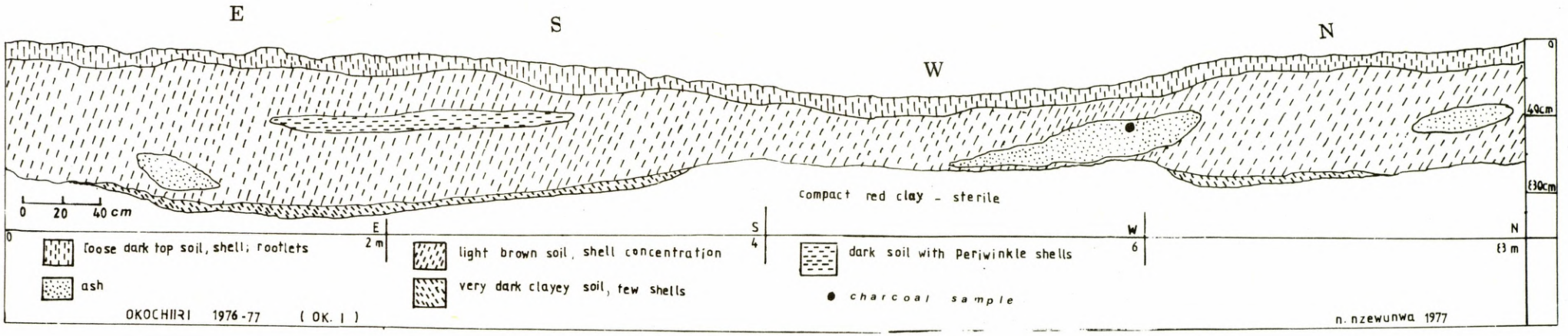


Figure V.9 Sections of OK II (East and South Walls)

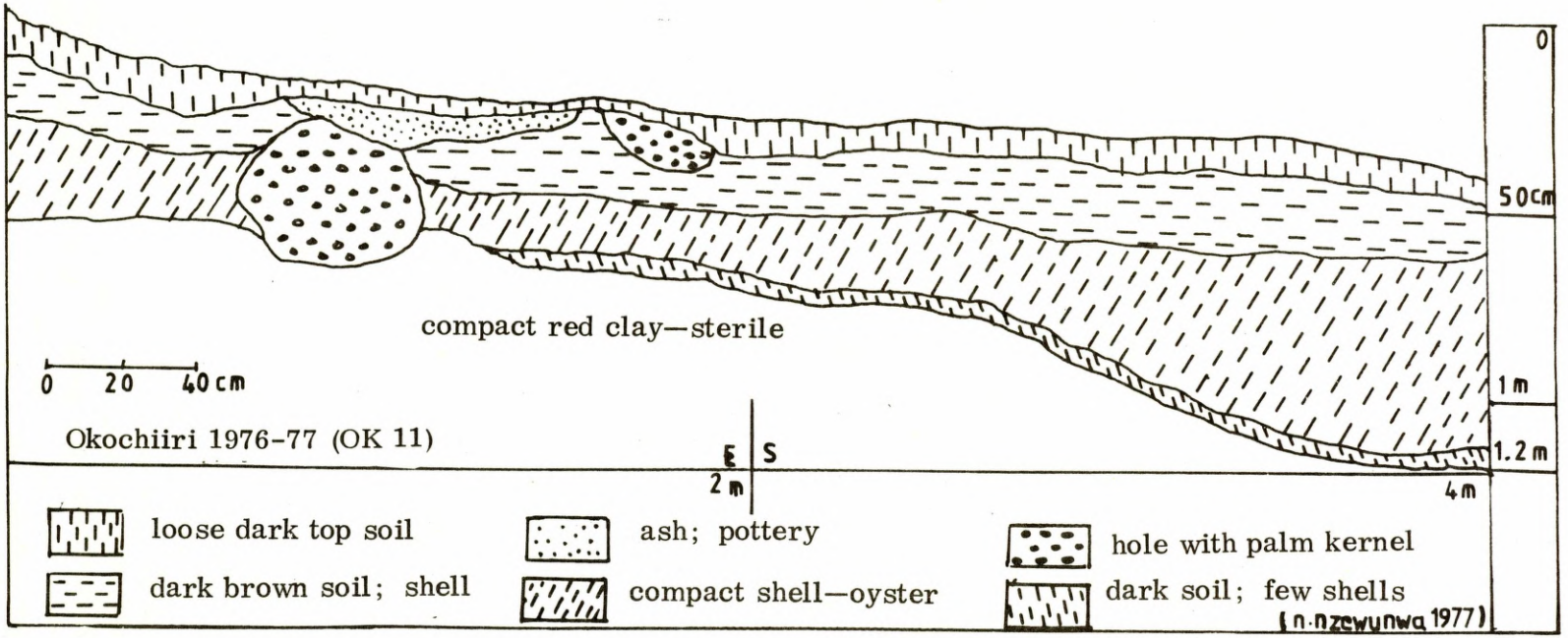
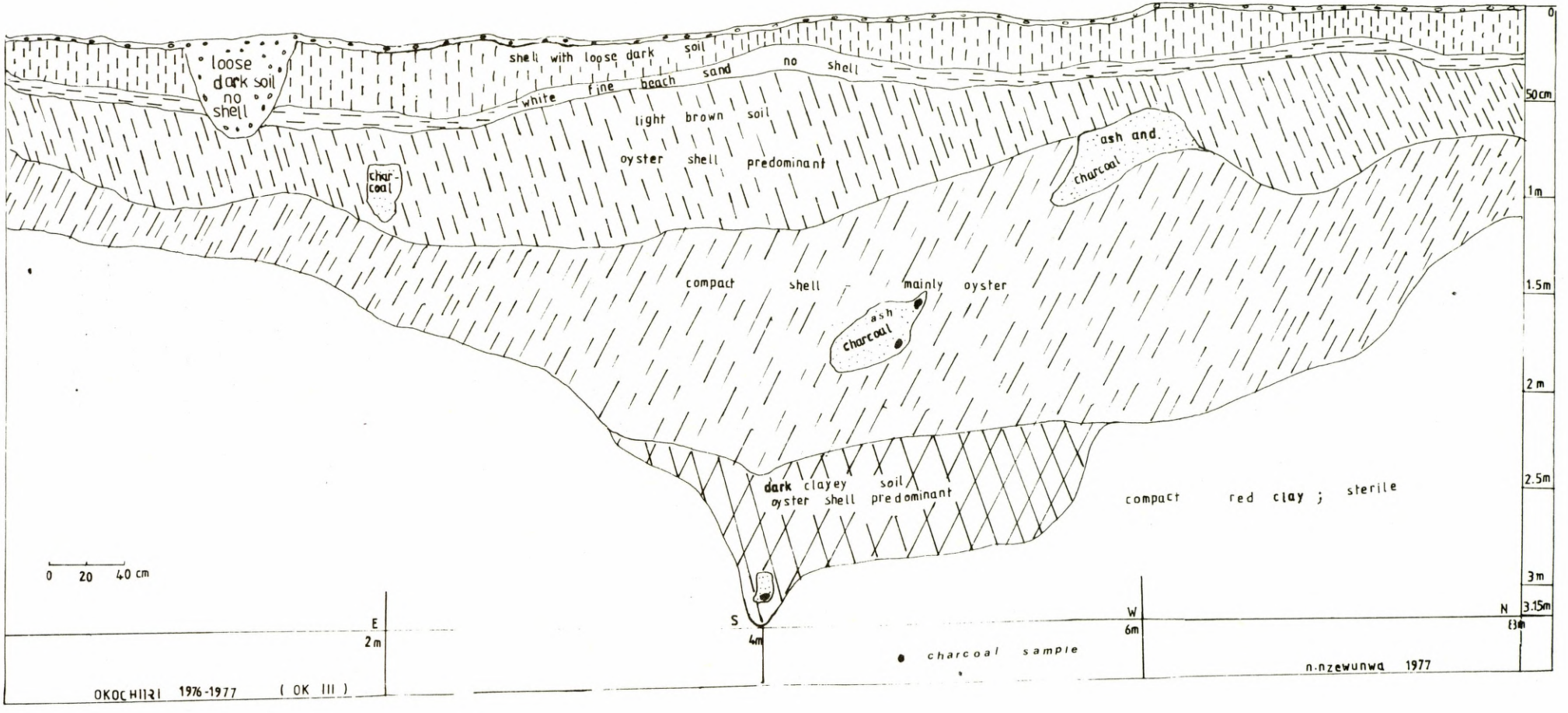


Figure V. 10 Sections of OK III



c) Brown Clay with Shells

This varied in thickness from one part to another. It started about 36 cm in the north down to 116 cm south from the surface giving a thickness of 20 - 82 cm in places. The soil was sticky and moist, cracking easily on exposure to the atmosphere. It was predominantly made of oyster shells.

d) Compacted Shells

The actual demarcation line between this and the brown clay stratum was not clear. However one feature of the compact shell stratum is that the soil was minimal, in most cases the shell deposit was of the nature which Elizabeth Speed (1969: 193) describes as "clean". With a thickness varying between 40 cm and 120 cm the unit contained a few lenses of ash and charcoal.

e) Pale Clay

The shell lenses are fairly compact but contained within a pale to dark clayey soil extending to a thickness of 88 cm to bedrock.

f) The bedrock was the same as in OK I.

Midden B

OK IV. Only one area of 2 x 2 m was excavated in midden B and it showed four distinct layers before bedrock.

a) Top Soil

This was about 12 cm thick. It was made up of dark loose friable soil and very few shells.

b) Compact Shell Layer

This was made up of compacted shell and had a uniform thickness of about 90 cm. The dominant shell was the oyster and there was hardly any soil in the uppermost part. There were occasional stains of pale to dark brown soil at the lower sections. Flakes of charcoal were encountered at different sections of the unit. A lens of ash mixed with charcoal and few shells occurred in the eastern section stretching southwards to a maximum of 98 cm and for a maximum thickness of 26 cm immediately below the top soil unit.

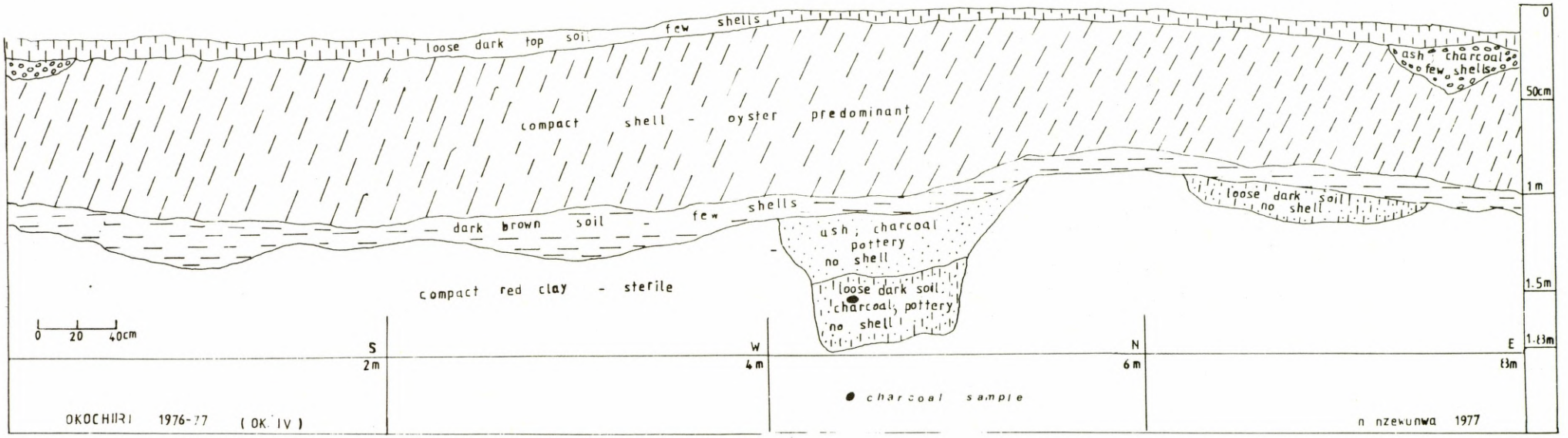
c) Dark Brown Soil

This unit about 11 cm thick contained very few shells and met bedrock in the south and west sections.

d) Loose Dark Soil

This unit occurred only in the north and east sections of the excavation. In the eastern section it had a maximum thickness of 21 cm below the dark brown soil and stretched for about 130 cm. There were neither shells nor sherds though there were pieces of charcoal. In the north section there were two portions. Topmost and closer to the stratum of dark brown soil, was an ash lens, mixed in places with loose dark soil, containing charcoal and potsherds but no shells. Below this was the second portion of mainly loose dark soil with charcoal and pottery but no shell or the predominant ash of the top part. Curiously enough the east and north areas of this unit were quite distinct. They appear to have originated in pits starting in the old land surface

Figure V. 11 Sections of OK IV



before the accumulation of the shell mound. If that was the case, they must have started as disposal pits for kitchen or domestic refuse as shown by the large quantity of charcoal, ash and potsherds recovered.

e) Bedrock was struck at a depth of 180 cm from the surface (see Fig. V.II).

Materials Recovered

The materials recovered from the excavation are broadly divided into those relating to food waste which are analyzed and interpreted in Chapters VI & VII and those that inform on the material culture (see Chapters VIII and IX).

The Food Wastes were of two kinds: 1) animal remains in the form of bones of birds, fish, sea and land animals and mollusca; and 2) vegetable remains of palm kernels and carbonized wood. No other recognizable vegetable matter was found but samples were submitted for pollen analysis.

Material Culture Artefacts were also recovered. These included a few fragments of iron objects from the top layers of OK III and OK IV. Ceramic artefacts were mainly potsherds though a few burnt or baked clay fragments were recovered from OK III. The major finds are presented in Table V.I below.

Table V.1 Some Finds from Excavated Middens in the Eastern Niger Delta

| Site/Midden Designation | Level | Iron | | Stone | | Copper | | | | Bone | | | | Shell | | Clay | | | Terracotta | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Slag | Object | Irion stone | 'Object' | Manilla | Sword part | Ornament | Palm kernel | Worked bone | Human | Fish/Animal | Other | Perforated | Native chalk | Crucible | Mould/tuyere | Baked/burnt | Human | Animal | Fish | Other | Smoking pipe | Glass object | Glazed ware | Cowrie shell |
| ONYOMA (ONY | S | | | | | | | | | | | | | | | | | | x | | | | x | | | |
| ONY IB | | | | | | | | | | | x | | x | | | | | | | | | | | | | |
| ONY I | 2 | | | | | | | | | | | x | x | | x | x | | | | | | | | | | x |
| | 3 | | | | | | | | | x | | x | | | | | | x | | | | | | (1460 $^{+}_{-}$ | 70 AD) | |
| | 4 | | | | | | | | | | | | | | | | | x | | | | | | | | |
| | 5 | | | | | | | | | | | | x | | | | | x | | | | | | | | |
| | 6 | | x | | | | | | | | | | x | | ? | | | x | | | | | | | | |
| | 7 | | | | | | | x | | | x | | x | | | x | | x | | | | | | | | |
| ONY II | 1 | | | | | | | | | | | | | | | x | | x | | | | | | (1750 $^{+}_{-}$ | 95 AD) | |
| | 2 | | | | | | | | | | | | x | | | | | x | | | | | | (1505 $^{+}_{-}$ | 85 AD) | |
| | 3 | | | | | | | | | | | | | | | | | x | | | | | | | | |
| | 4 | x | | | | | | | | | | x | | | | | | x | ? | | | | | (1355 $^{+}_{-}$ | 80 AD) | |
| | 5 | | | | | | | | | | | | x | | | | | x | | | | | | | | |
| | 6 | | | | | | | | | | | | x | | | | | | | | | | | | | |
| | 8 | | | | | | | | | | | | | | | | | x | | | | | | | | |
| SAIKIRI-POGU SI | S | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 1 | | | | | | | | | | | x | x | | | | | x | | | | | | | | |
| | 2 | | | | | | | | | | | x | x | | | | | x | | | | | | | | |
| | 3 | | | | | | | | | | | x | | | | | | | | | | | x | (1405 $^{+}_{-}$ | 60 AD) | |

Table V.1 (contd.)

| Site/Midden Designation | Level | Iron | | Stone | | Copper | | | | Bone | | | | Shell | | Clay | | | Terracotta | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Slag | Object | Irion stone | 'Object' | Manilla | Sword part | Ornament | Palm kernel | Worked bone | Human | Fish/Animal | Other | Perforated | Native chalk | Crucible | Mould/tuyere | Baked/burnt | Human | Animal | Fish | Other | Smoking pipe | Glass object | Glazed ware | Cowrie shell | |
| Ke II | 2 | | | | | | | | | | | x | x | | | | | x | | | | | | | | | |
| | 7 | | | | | | | | | | | x | x | | | | | x | | | | | | | | | |
| Unrecorded stratigraphy | | | | | | | | | | | | | | | | | | | | | | | | (1600 $^{+}_{-}$ 65 AD) | (970 $^{+}_{-}$ 75 AD) | | |
| | Ke II | | | | | | | | | | | | | | | | x | | x | | | ? | | | | | |
| KeIII | 5 | | | | | | | | | | | x | | | | | | x | | | | | | | | | |
| | 7 | | | | | | | | | | | x | | | | | x | | | | | | | (1185 $^{+}_{+}$ 85 | | | |
| | 11 | | | | | | | | | | | | | x | | | x | | | | | | | (1160 $^{+}_{-}$ 80 | | | AD |
| OGOLOMA (OGL) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | S | | | | | x | | | | | | x | | | | | | | | | | | Tab VIII 4 | x | x | | |
| IA | 1-3 | | | | | | | | | | | | | | | | | | | | | x | | | | | |
| | 4 | | | | | | x | | | | | | | | | | | | | | | | | | x | | |
| | 5 | | | | | x | | | | | | | | | | | | | | | | | | | | | |
| | 12 | | | | | | | | | | | | | | | ? | | | | x | x | | | | x | | |
| | 16 | | | | | | | x | | | | | | | | | | | | | | | | (1345 $^{+}_{-}$ | 100 | AD | | |

Table V.1 (contd.)

| Site/Midden Designation | Level | Iron | | Stone | | Copper | | | | Bone | | | | Shell | | Clay | | | Terracotta | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Slag | Object | Irion stone | 'Object' | Manilla | Sword part | Ornament | Palm kernel | Worked bone | Human | Fish/Animal | Other | Perforated | Native chalk | Crucible | Mould/tuyere | Baked/burnt | Human | Animal | Fish | Other | Smoking pipe | Glass object | Glazed ware | Cowrie shell |
| SI | 4 | | | | | | | | | | | x | x | | | | x | | | | | | | | | |
| | 5 | | | | | | | | | | | | x | | | | x | | | | | ? | | | | |
| | 6 | | | | | | | | | | | | | | | | x | | | | | | | (1135 $^{+}_{-}$ | | 125 AD) |
| SII | 1 | | x | | | | | | x | | | | x | x | | | | | | | | | | x | | |
| | 2 | | | | | | | | | | | | | | | | | x | | | | | | | | |
| | 3 | | | | | | | | | | | | | | | | x | x | | | | | | | | |
| | 4 | | | | | | | | | | | | | | | | x | | | | | | | | | |
| SIII | 2 | | | | | | | | | | | | x | | | | x | | | | | | x | | | |
| | 3 | | x | | | | | | | | | x | x | | | | x | | | | | | | | | |
| | 4 | | | | | | | | | | | | x | | | | ? | | | | | | | (1485 $^{+}_{-}$ | | 125 AD) |
| | 5 | | | | | | | | | | | x | x | | ? | | x | | | | | | | (1580 $^{+}_{-}$ | | 60 AD) |
| | 6 | | | | | | | | | | | | x | | | | x | | | | | | | | | |
| | 7 | | | | | | | | | | | | x | | | | x | | | | | | | | | |
| | 8 | | | | | | | | x | | | | x | | | | x | | | | | | | | | |
| KE (Ke) | S | | | | x | | | x | | | | x | | x | | | | | | | | | x | | | |
| KeI | 1 | x | x | | | 276 | | | x | | | x | x | | | | x | | | | | | | | x | |
| | 3 | | | | | x | | | | | | | | | | | | | | | | | | | | |
| | 6 | | | | | | | | | | | | | | | | x | | | | (985 ± | | 105 | AD) | x | |
| | | | | | | | | | | | | | | | | | | | | | 850 ± | | 80 | AD) | | |

Table V.1 (contd.)

| Site/Midden Designation | Level | Iron | | Stone | | Copper | | | | Bone | | | | Shell | | Clay | | | Terracotta | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Slag | Object | Irion stone | 'Object' | Manilla | Sword part | Ornament | Palm kernel | Worked bone | Human | Fish/Animal | Other | Perforated | Native chalk | Crucible | Mould/tuyere | Baked/burnt | Human | Animal | Fish | Other | Smoking pipe | Glass object | Glazed ware | Cowrie shell |
| OGL IA | 21-22 | | | | | | | | | | | | | | | | | | | | | x | | | | |
| | 23-24 | | | | x | | | | | x | x | | | | | | | | | | x | x | | | | |
| IB | 1 | | | | | | | | | | | | | | | | | | | | | | | x | | |
| | 3 | | | | | | x | | | | | | | | | | | | | | | | | | | |
| | 7 | | | | | | | | | | | | | | | | | | | | | x | | (1840 +- 75 AD) | | |
| | 8 | | x | | | x | | | | | | | | | | | | | | | | | | | | |
| IC | 1/2 | | | | x | | | | | | | | | | | | | | | | | | | | | |
| | 5/6 | | x | x | | | | | | | | | | | | | | | | | | x | | (1825 +- 75 AD) | | |
| | 7/8 | | | x | x | | | | | | | | | | | | | | | | | x | | x | | |
| | 17 | | | | | | | | | | | | | | | | | | | | | | | x | | |
| ID | 1/2 | | | x | | | | | | | | | | | | | | | | | | x | x | x | | |
| | 5 | | | | | | x | | | | | | | | | | | | | | | | | | | |
| | 10 | | | | | | | | | | | | | | | | | | | | | x | | | | |
| OKOCHIRI (OK) | S | | | | | ? | | | | | | x | | | | | | | | | | | x | | | |
| OK I | 1 | | | | | | | | | | | | | | | | | x | | | | | | | | |

Table V.1 (contd.)

| Site/Midden Designation | Level | Iron: Slag | Iron: Object | Stone: Irion stone | Stone: 'Object' | Copper: Manilla | Copper: Sword part | Copper: Ornament | Palm kernel | Bone: Worked bone | Bone: Human | Bone: Fish/Animal | Bone: Other | Shell: Perforated | Shell: Native chalk | Clay: Crucible | Clay: Mould/tuyere | Clay: Baked/burnt | Terracotta: Human | Terracotta: Animal | Terracotta: Fish | Terracotta: Other | Smoking pipe | Glass object | Glazed ware | Cowrie shell |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OK I | 2 | | | | | | | | x | | | x | | | | | | x | | | | | | (940 ± | 80 AD) |
| | 4 | | | | | | | | | | | x | | | | | | x | | | | | | | |
| | 5 | | | | | | | | | | | x | | | | | | x | | | | | | | |
| OK II | 1 | | | | | | | | | | | x | | | | | | x | | | | | | | |
| | 2 | | | | | | | | x | | | x | | | | | | x | | | | | | | |
| | 3 | | | | | | | | x | | | x | | | | | | x | | | | | | | |
| | | | | | | | | | | | | x | | | | | | | | | | | | | |
| OK III | 2 | | x | | | | | | x | | | x | | | | | | | | | | | | (1225 ± | 85 AD) |
| | 10 | | | | | | | | | | | x | | | | | | x | | | | | | | |
| | 18 | | | | | | | | | | | x | | | | | | x | | | | | | (1425 ± | 90 AD) |
| OK IV | 2 | | x | | | | | | | | | | | | | | | | | | | | | | |
| | 4 | | | | | | | | | | | | | | | | | x | | | | | | | |
| | 9 | | | | | | | | | | | | | | | | | x | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | (965 ± | 85 AD) |

s = Surface
x = present
Dates are interpolated

# CHAPTER VI

## SHELL MIDDEN ANALYSIS

### Introduction

The shell midden analysis attempted here is experimental in nature in the sense that no similar work has been undertaken in West Africa. The objectives are therefore limited to methods of data recovery, analysis and interpretation within the context of the Niger delta shell middens. The objectives are: 1) to see to what extent methods of shell midden study developed in other parts of the world apply to the Niger delta shell middens and how they can be adapted with the aim of using minimum time, labour and finances without sacrificing efficiency and without reducing the quality of the data necessary for understanding the economic and material culture components of the sites. Related to this is the determination of sample size, field and laboratory processing—sieving, screen size and flotation; 2) study of the midden components from different sites to see what characteristics are common to the sites singly and in groups; 3) to use the economic components of the middens to evaluate the contribution of fish, shellfish and animal resources to the diet of the groups responsible for the accumulation of the middens; 4) to estimate the age of the midden and size of population by using the potentials of the economic components of the middens; 5) in relation to 3) and 4) above, the need to test the hypothesis that the quantity of shellfish in the middens is a correct reflection of the contribution of shellfish in the diet- in short, that shellfish was the staple diet in the riverine delta.

### 1. Archaeology and Shell Middens

As mentioned in Chapter IV the mollusca are found all over the world, their wide variety reflecting varying ecological situations. In West Africa as the works of Knudsen (1946, 1956) and Nickles (1955) show, they are found from the coast of Mauretania as far south as the Cape. Although not everywhere documented, their utility as a food resource reflects this ubiquity and is demonstrated by the number of shell middens along the coastline.

Bailey (1975) has shown in an interesting study of the mollusca with a bioarchaeological bias, that the occurrence of shell middens is a world wide phenomenon. While it is not known for certain where the use of mollusca as a food resource started, it may be suggested to have been at least 10,000 years ago. The middens of San Diego, California date to between 7500 and 5500 BP (Shackleton 1969: 410), of northern Europe to 7000-8000 years ago (Clark 1952) of Japan at least 9000 BP and in Peru to 6000-7000 BP (Meighan 1969: 417). A reason for this shift to mollusc collection may plausibly be seen as a global deficiency in protein in some areas occasioned by the extinction of large animals of the Pleistocene (Meighan 1969). This explanation must be received with reservation in West Africa for the adaptations suggested for

the Pleistocene-Holocene boundary observed for the temperate regions of the world may not have applied to tropical West Africa (see Chapter IV).

However the use of shellfish was well established in South Africa in the 6th millennium B.C. as excavations at Matje's River dated 5800 B.C. and Klasie's River show (Woodhouse 1971: 89, 92). The oldest evidence in North Africa comes from the site of Haua Fteah (McBurney 1967). A number of other caves with shell deposits have also been excavated in South Africa (Maggs and Speed, 1967; Speed 1969; Avery 1974; Van Noten 1974). Their association with lithic and other faunal materials is also noteworthy.

In West Africa shell middens have been reported from Mauretania (Elouard 1969), from Senegal (Linares de Sapir 1970), from the Ivory Coast and Senegal (Mauny 1973) and from Nigeria (Anozie 1973, 1976). Documented in this form though still fragmentary, it is clear therefore that the occurrence of shell middens as an archaeological manifestation of shellfish utilization is widely spread in Africa. Most of the excavations have however followed 'traditional' archaeological procedures although a clear picture emerges from the analysis of the Senegalese and later South African excavations (Parkinton 1976). However none of these African midden excavations or analytical procedures except Eland cave (Parkinton 1976) have used the methods and techniques developed for shell midden studies in other continents.

Interest in shell middens as a source of bioarchaeological data appears to have started in the later 19th century with the excavation of the Danish kitchen middens (Madsen 1900). But the techniques of midden excavation, sampling and analysis were pioneered, developed and refined in North America. Outside of this area only the Australian and New Zealand shell middens have received similar analytical study. The pioneer work of Nelson (1909, 1910) and Gifford (1916) on California mounds was geared towards quantitative techniques for the determination of age and population of the represented cultures. The later studies had sought ways of improving the early techniques or devising new ones for the assessment of population and nutrition (Cook 1946, 1972; Cook and Treganza 1947, 1950; Ascher 1959) and for the shell content only (Greenwood 1961). Studies carried out in Australia and New Zealand (Ambrose, 1963, 1967; Davidson 1964a, 1964b; Shawcross 1967, 1970; Coutts 1967, 1972) have followed similar lines if with greater precision.

A review of the relevant literature shows that so far emphasis is placed on quantification from Nelson (1909) through Gifford (1916) to Cook and Tregaza (1947, 1950), Cook and Heizer (1951, 1965), Ascher (1959), Treganza and Cook (1948) and Coutts (1972). Because of the peculiar circumstances surrounding archaeological phenomena with regard to differential preservation, excavation and researcher's bias, which reduce the quality and quantity of the data, a number of assumptions, estimations and approximations must of essence, be employed in shell midden analysis.

The present study is aimed at applying the techniques of midden analysis to the Niger delta shell middens. Since it is experimental, the study must place emphasis on procedures and midden content. These will be developed to accommodate two aspects of the archaeological material—economy and culture.

2. Midden Sampling

Archaeological excavations by their nature and scope are typical of samples and their procedures are part of the wider field of sampling. Even when entire archaeological features or manifestations are excavated, the factors of differential preservation reduce such an exercise to the wider kinds of sampling. As total excavations are prohibitive in time, labour and financial costs it has become the rule in most archaeological excavations to adopt sampling procedures best suited to the problems they are set to solve. The objective in midden sampling is that the total composition of the site be inferred from the samples.

Following experiments conducted in America with the excavation of a total midden (Treganza and Cook 1948) and results from a set of samples taken from the same midden and earlier experiments (Cook and Treganza 1947) it came to be established that the quality of data from a totally excavated midden did not improve significantly over the samples. Midden sampling has therefore become a standardized procedure for investigating shell middens. Although there are a number of sampling methods in archaeology (Ragir 1972; Anderson 1973) the California archaeologists preferred column sampling for midden analysis. In its orthodox form the method requires that an excavation feature be vertically exposed in test pits and samples taken three-dimensionally at intervals; that the midden be horizontally homogenous; and that the elements of the samples should often be minute (Ragir 1972: 189). However the procedure has at times been complemented or replaced by arbitrarily procured samples from different parts of a midden (Cook and Treganza 1947: 135).

a) Sample Size

There has been inconsistency in the use of column sampling with reference to the size of the column (the dimensions) and size of its content (the weight of the elements of the sample). Gifford (1916) used an average of 119 gms, Cook and Treganza (1948) used 453.6-2268 grams, Cook and Heizer (1951) used samples contained within 3 x 3 x 12 cubic inches, Greengo (1951) used 500-1000 gms and Ascher (1959) 2000 gms. Cook and Treganza (1948), from experiments with total excavation of a mound, showed that sampling for evenly distributed components would yield accurate results with 15 to 30 samples weighing from 500-1000 gm corrected to $\pm$ 5% standard error of mean. Greenwood (1961) showed in a later experiment that samples reduced to 500 gms would yield reliable results. Although the choice of a critical sample size is left to the archaeologist it is worth remembering that the size of the midden component shoud influence the size of the sample (weight) as also should its density.

In the present study a three-step procedure was adopted to study the midden stratigraphy, component, volume, size of screen and sample. Although the analysis was conducted for varying samples from four middens called here A, B, C, D, the analysis reported below refers mainly to midden A. With a standardized procedure, the steps in the approach apply to all but it has been considered unnecessary to burden the report with repeated statistics. Thus, the summary data and statistics only are supplied for middens B, C, D, mainly in the form of tables and figures. Where comparisons

Table VI.1 Midden A: Sieving Results before Sorting into Components (wt in grams)

| Sample No. | 25 mm (g) | 12 mm (g) | 2mm (g) | Hand Picked (g) |
|---|---|---|---|---|
| 1 | 6,300 | 1,051 | 11,100 | 1,100 |
| 2 | 10,170 | 2,100 | 9,250 | 2,150 |
| 3 | 24,550 | 4,700 | 11,800 | 1,100 |
| 4 | 59,250 | 8,150 | 23,450 | 1,200 |
| 5 | 12,450 | 1,950 | 6,050 | 300 |
| 6 | 34,580 | 6,800 | 16,700 | 1,100 |
| 7 | 10,550 | 1,900 | 5,200 | 1,500 |
| 8 | 27,950 | 5,200 | 12,150 | 850 |
| 9 | 24,500 | 4,700 | 10,750 | 1,200 |
| 10 | 57,900 | 6,200 | 5,900 | 2,500 |
| 11 | 9,500 | 1,350 | 14,050 | 700 |
| 12 | 7,000 | 1,650 | 3,500 | 500 |
| 13 | 4,300 | 800 | 2,050 | 570 |
| 14 | 3,850 | 600 | 1,950 | 300 |
| 15 | 3,000 | 1,300 | 2,000 | 360 |
| Total | 295,850 | 48,451 | 135,900 | 15,430 |
| Mean | 19,723.3 | 3,230.3 | 9,060.0 | 1,028.7 |
| % Mean | 59.69 | 9.78 | 27.42 | 3.11 |

are made such as the indidence of screen size, size of sample or the component of the midden or of fractionalization of the species of mollusca and therefore the critical screen size a reference is made to all midden samples.

In the first stage three excavation units were cut in two middens, A and B, to study their stratigraphy and content (Refer to Chapter V excavations OK I, II, IV). In the second stage a unit 2 x 2 square metres was excavated in 15 cm spits from top to bedrock (Refer to Chapter V excavation OK III). All components from each spit were passed through three screen sizes 25 mm, 12 mm, 2 mm, (Tables VI.1-4). In the third phase, three sets of samples were collected: 15 each from middens B and C and 22 from midden D, with wet weights varying from 1,800 gms to 3,500 gms. The samples from middens B, C, D were weighed immediately on procurement and sent to the Laboratory of Archaeology, University of Nigeria, Nsukka, where they were left to air dry under room temperature for 14 weeks after which they were reweighed, passed through screen sizes 25 mm, 12 mm, 4 mm and 2 mm, sorted component by component, reweighed screen size by screen size. See Tables VI.5-7.

For midden A the sample size ranged from 6,330 gms to 69,901 gms. After the initial screening they were washed, dried, and stored in cotton bags for two weeks after which they were reweighed, sorted according to component (Table VI.2), weighed again according to screen size (Table VI.3). The shells were then separated according to species retained by each screen (Table VI.4). The samples from midden A were expected to fulfill two conditions—that the samples were from columns of definable three dimensions; and second, that the sample satsified statistical procedures in relation to size. Their size, over ten times the size advocated by Greenwood (1961) which is the smallest advocated by Greengo (1951) was over six times the largest advocated by Treganza and Cook (1948) and Greengo (1951). The sample size from each of the other three middens B, C, D was tailored within the specification of earlier workers. However, the variation would enable the study to standardize the sample size for future work.

b) Midden Size

The estimate of total midden composition and therefore total composition of each component is vital for a proper midden alaysis. This estimate relies on the measurement of the volume of the midden on the one hand and the density of the midden composition derived from the samples on the other.

Studies of midden forms (Cook and Treganza 1947, 1950) and our field observations (Ch.V) show that shell middens do not conform to any regular shape or dimension. As a result some form of approximation is necessary. The majority of Niger delta middens are oval in outline. To measure the middens the linear dimensions were taken using a 30 metre tape or pacing or a combination of the two. It was most difficult and in most cases impossible to estimate certain midden heights which rise above present ground surface but originate further below it. Heights of middens situated at the edge of tidal rivers and subjected to creek erosion proved unamenable to attempts at mensuration as much eroded material which had drifted down the creek obstructed the observation of any defined profile or column.

Table VI.2 Midden A: Component Weights after Sorting
(wt in grams)

| Sample | Shell (g) | Pottery (g) | Bone (g) | Charcoal (g) | Palm Kernel (g) | Metal (g) | Burnt Clay (g) |
|---|---|---|---|---|---|---|---|
| 1 | 17,623 | 680 | 40 | 40 | 40 | 9 | 0 |
| 2 | 21,145 | 325 | 35 | 35 | 0 | 0 | 0 |
| 3 | 39,385 | 617 | 41 | 25 | 42 | 0 | 0 |
| 4 | 90,316 | 970 | 55 | 2 | 10 | 0 | 0 |
| 5 | 19,932 | 480 | 33 | 1 | 0 | 0 | 48 |
| 6 | 57,375 | 600 | 95 | 35 | 0 | 0 | 0 |
| 7 | 17,405 | 240 | 10 | 1 | 0 | 0 | 0 |
| 8 | 44,713 | 550 | 34 | 2 | 6 | 0 | 0 |
| 9 | 39,287 | 500 | 140 | 12 | 40 | 0 | 0 |
| 10 | 68,450 | 1345 | 105 | 1 | 0 | 0 | 0 |
| 11 | 24,409 | 330 | 90 | 1 | 0 | 0 | 0 |
| 12 | 10,870 | 300 | 30 | 10 | 18 | 0 | 40 |
| 13 | 6,891 | 211 | 48 | 0 | 0 | 0 | 0 |
| 14 | 6,120 | 240 | 40 | 28 | 0 | 0 | 0 |
| 15 | 6,120 | 120 | 90 | 0 | 0 | 0 | 0 |
| Total | 470,040.0 | 7,508.0 | 886.0 | 193.0 | 156.0 | 9.0 | 88.0 |
| Mean | 31,336.1 | 500.5 | 59.1 | 12.9 | 10.4 | 0.6 | 5.9 |
| % Mean | 98.15 | 1.57 | 0.19 | 0.04 | 0.03 | 0.02 | 0.02 |

Table VI.3 Midden A: Sieving Results - Components by Screen Size

| | Shell | | | Potsherd | | | Bone | | | Charcoal | | | Palm Kernel | | | Metal | | | Burnt Clay | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mesh Size | 25 | 12 | 2 | 25 | 12 | 2 | 25 | 12 | 2 | 25 | 12 | 2 | 25 | 12 | 2 | 25 | 12 | 2 | 25 | 12 | 2 |
| Sample No. | (gm) | (gm) | (gm) | (gm) | (gm) | (gm) | (gm) | (gm) | (gm) | (gm) | (gm) | (gm) | (gm) | (gm) | (gm) | (gm) | (gm) | (gm) | (gm) | (gm) | (gm) |
| 1 | 5,870 | 901 | 10,852 | 400 | 80 | 200 | 30 | 0 | 10 | 0 | 25 | 15 | 0 | 30 | 10 | 0 | 0 | 9 | 0 | 0 | 0 |
| 2 | 10,025 | 2,030 | 9,090 | 120 | 75 | 130 | 25 | 0 | 10 | 0 | 35 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3 | 24,098 | 4,595 | 10,692 | 450 | 100 | 67 | 0 | 1 | 40 | 0 | 20 | 1 | 2 | 40 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4 | 59,249 | 7,841 | 23,198 | 500 | 270 | 200 | 10 | 0 | 45 | 0 | 0 | 2 | 1 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5 | 12,136 | 1,849 | 5,947 | 280 | 100 | 100 | 30 | 1 | 2 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 40 | 0 | 0 |
| 6 | 34,360 | 6,475 | 16,340 | 200 | 300 | 100 | 20 | 25 | 50 | 0 | 4 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7 | 10,395 | 1,850 | 5,160 | 160 | 50 | 30 | 1 | 0 | 9 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8 | 27,648 | 4,992 | 12,073 | 300 | 200 | 50 | 1 | 8 | 25 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 9 | 24,170 | 4,490 | 10,627 | 300 | 140 | 60 | 50 | 30 | 60 | 0 | 9 | 3 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10 | 56,795 | 5,841 | 5,841 | 1,080 | 220 | 45 | 35 | 30 | 40 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11 | 9,340 | 1,130 | 13,939 | 160 | 140 | 30 | 0 | 10 | 80 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12 | 6,740 | 700 | 3,430 | 260 | 0 | 40 | 0 | 0 | 30 | 0 | 0 | 10 | 0 | 18 | 0 | 0 | 0 | 0 | 40 | 0 | 0 |
| 13 | 4,162 | 700 | 2,029 | 130 | 80 | 1 | 8 | 20 | 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 14 | 3,670 | 540 | 1,910 | 180 | 40 | 20 | 0 | 20 | 20 | 0 | 28 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 15 | 2,940 | 1,240 | 1,940 | 50 | 30 | 30 | 30 | 30 | 30 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 3,013,185 | 45,959 | 133,239 | 4,580 | 1,825 | 1,103 | 240 | 176 | 471 | 0 | 155 | 29 | 3 | 137 | 10 | 0 | 0 | 9 | 80 | 0 | 0 |
| Mean | 19,440 | 3,030 | 8,883 | 306.3 | 73.5 | 16 | 16 | 12 | 32 | 0 | 10 | 2 | 0 | 9 | 1 | 0 | 0 | 1 | 5 | 0 | 0 |
| %Mean | 58.7 | 9.2 | 26.8 | 0.9 | 0.4 | 0.2 | 0.1 | 0.4 | 0.1 | 0 | 0.1 | 0 | 10 | 0.1 | 0.0 | 0 | 0 | 0 | 0.1 | 0 | 0 |

Table VI.4 Midden A: Sieving Results-Shellfish Species by Screen Size

| | Gryphae | | | Tympanotonus | | | Achatinids | | | Thais | | | Anadara Arca | | | Razor | | | Semifusus | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mesh(mm) | 25 | 12 | 2 | 25 | 12 | 2 | 25 | 12 | 2 | 25 | 12 | 2 | 25 | 12 | 2 | 25 | 12 | 2 | 25 | 12 | 2 |
| Sample No. | (gm) | (gm) | (gm) | (gm) | (gm) | (gm) | (gm) | (gm) | (gm) | (gm) | ⟶ | | | | | | | | | | |
| 1 | 4,370 | 85 | 10,770 | 150 | 50 | 40 | 0 | 1 | 0 | 590 | 0 | 0 | 350 | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | 8,725 | 1,613 | 1,056 | 260 | 360 | 30 | 30 | 0 | 0 | 640 | 2 | 0 | 1,000 | 40 | 3 | 0 | 0 | 0 | 70 | 0 | 0 |
| 3 | 23,189 | 3,517 | 10,687 | 450 | 890 | 50 | 49 | 50 | 0 | 400 | 30 | 0 | 10 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4 | 56,549 | 7,541 | 23,126 | 200 | 300 | 50 | 0 | 1 | 0 | 1,100 | 5 | 0 | 1,400 | 200 | 2 | 0 | 5 | 0 | 75 | 0 | 0 |
| 5 | 10,961 | 1,637 | 5,942 | 100 | 160 | 3 | 0 | 0 | 0 | 600 | 2 | 0 | 400 | 50 | 2 | 0 | 0 | 1 | 0 | 0 | 0 |
| 6 | 31,709 | 5,721 | 16,537 | 200 | 600 | 1 | 0 | 4 | 0 | 1,100 | 5 | 0 | 1,300 | 140 | 1 | 5 | 25 | 1 | 0 | 0 | 0 |
| 7 | 9,655 | 1,625 | 5,157 | 050 | 200 | 2 | 1 | 1 | 0 | 240 | 2 | 0 | 400 | 2 | 0 | 50 | 20 | 1 | 0 | 0 | 0 |
| 8 | 27,318 | 4,368 | 12,064 | 250 | 500 | 7 | 1 | 2 | 0 | 1,250 | 2 | 0 | 2,000 | 100 | 0 | 90 | 25 | 2 | 0 | 0 | 0 |
| 9 | 23,210 | 3,910 | 10,587 | 250 | 440 | 30 | 10 | 20 | 0 | 920 | 20 | 0 | 680 | 50 | 0 | 100 | 50 | 10 | 0 | 0 | 0 |
| 10 | 52,795 | 5,774 | 5,774 | 500 | 610 | 4 | 40 | 20 | 0 | 1,460 | 9 | 0 | 1,760 | 50 | 0 | 240 | 100 | 0 | 0 | 0 | 0 |
| 11 | 7,830 | 13,936 | 13,936 | 80 | 350 | 1 | 0 | 5 | 0 | 300 | 20 | 0 | 750 | 4 | 1 | 240 | 100 | 1 | 0 | 0 | 0 |
| 12 | 6,080 | 3,426 | 3,426 | 60 | 0 | 1 | 20 | 0 | 0 | 200 | 0 | 0 | 380 | 0 | 1 | 10 | 0 | 2 | 0 | 0 | 0 |
| 13 | 3,662 | 2,005 | 2,005 | 50 | 100 | 1 | 20 | 0 | 0 | 190 | 1 | 0 | 180 | 40 | 0 | 60 | 75 | 3 | 0 | 0 | 0 |
| 14 | 3,310 | 1,910 | 1,910 | 50 | 160 | 0 | 40 | 20 | 0 | 80 | 20 | 0 | 150 | 50 | 0 | 40 | 0 | 0 | 0 | 0 | 0 |
| 15 | 2,490 | 1,940 | 1,940 | 50 | 230 | 0 | 0 | 20 | 0 | 50 | 0 | 0 | 310 | 40 | 0 | 40 | 30 | 0 | 0 | 0 | 0 |
| Total | 271,853 | 37,644 | 132,917 | 2,700 | 4,950 | 220 | 212 | 144 | 0 | 9,120 | 118 | 0. | 11,070 | 774 | 38 | 885 | 430 | 21 | 150 | 0 | 0 |
| Mean | 18,124 | 2,510 | 8,861 | 180 | 330 | 15 | 14 | 9.6 | 0 | 608 | 7.8 | 0 | 738 | 50.6 | 2.5 | 59 | 28 | 2 | 10 | 0 | 0 |
| % Mean | 56.2 | 7.8 | 29.5 | 0.5 | 1.0 | 0.1 | 0.1 | 0.1 | 0 | 1.89 | 0.1 | 0 | 2.3 | 0.2 | 0.0 | 0.2 | 0.1 | 0 | 0.1 | 0 | 0 |

Cook and Treganza (1947: 138) established that two geometrical formulae apply to two types of middens. The first formula

$$V = (1/6)\ \pi\ h\ (h^2 + 3r^2)$$

where V is the volume of the midden
h is the height
r is the radius

applies to middens shaped like the segment of a sphere. The second which applies to a conically shaped midden employs the fomula

$$V = (1/8)\ \pi\ r^2 h$$

where V is the volume of the midden
h is its height
r is its radius

In the first formula the maximum is the centre with the periphery almost circular while in the second the sides are sloped linearly rather than curvilinearly from the apex or top. An estimated error of $\pm$ 25% is considered applicable to these volumetric calculations (Cook and Treganza 1950).

As midden A on which the calculations are based is like the segment of a sphere the first formula has been used. Thus

$$V = (1/6)\ \pi \times 5\ (5^2 + 3 \times 27^2) \pm 25\%$$

$$= 5,791 \pm 25\% \text{ cubic metres.}$$

The volume of the spit with regular dimensions takes the simple formula $V = l \times b \times h$

where V is the volume of the sample
l is its length
b is its breadth
h is its height.

The volume of a spit is 2 x 2 x 0.15 cubic metres. To calculate the density of the sample reference is made to Table VI.2 and the mean of the total weight in this case taken as made up of 15 samples is used in the calculation using the formula

$$d = \frac{w}{v}$$

where d is the density of the sample
w is the weight per sample
v is the volume of the sample

$$d = \frac{31925.33}{0.6} = 53,209$$

for purposes of convenience large figures are reduced to nearest whole number and weights expressed in kilograms and grams. For the entire midden A, the mass is calculated by

$$M = V \times d = 5,791 \times 53,209 \pm 25\%$$

$$= 308,130 \text{ kg} \pm 25\%$$

where M is the mass of the midden
V is its volume
d is the density of the midden.

It is clear from these preliminary calculations that once the midden density is established it will be easy to calculate mass of middens using measurements obtained in the course of their survey and mapping. The steps be which the computations had been done had been included for purposes of clarity and crosscheck.

c) Midden Composition

Twelve excavated shell middens in the Eastern delta show that midden contents vary not only in quantity but also in quality which also reflect the intensity of their occupation and age. These materials may broadly be grouped into materials concerned with economy and those of material culture. Perhaps more conveniently for the moment they may divide into components according to raw materials—shells; clay-pottery, burnt clay; bones; egetable—charcoal, palm kernel; metal.

Table VI.2 shows the components of midden A and the relative mean percentages. Figures VI.1 and 2 graphically illustrate the variation more vividly. In the same manner the components of middens B, C and D are presented in Tables VI.5, 6 and 7 respecitvely. The mean percentage composition of each component illustrates the relationship between materials. Note that the percentage composition of these middens B, C, D take into consideration three phenomena—firstly a situation where the residues (sand etc.) and moisture are taken into consideration; secondly a situation where the dry weight is the index of calculation, and thirdly, a situation where only normal midden contents bearing on economy and culture are used. In the third case it will be observed that the percentages for the middens come close together. There are two modes of presenting midden data: in absolute weight values and in percentages. The former is useful in calculations where absolute values are necessary and the latter for comparative purposes. The two models have been used to satisfy these various needs in this study. Presentation of field data has been done in absolute values as the tables show while some summary statistics and figures (graphs) are given in percentages.

Table VI.8 summarizes the midden components for four sampled middens expressed in percentages. The shell component shows a consistency. Only in midden D is there a deviation of about 5% from the mean of the four middens. The consistency in the summary statistics agrees fairly well with the sample weights across entire middens. Shell is therefore the major component of the middens with a mean percentage of 93.9.

Pottery ranks next with a mean percentage of 5.7. There appears to be an inverse relationship between the shell and pottery components. The more the shell the less the pottery and vice versa. Hence midden A is 98.2% shell and 1.6% pottery and Midden D is 88.3% shell and 11.3% pottery.

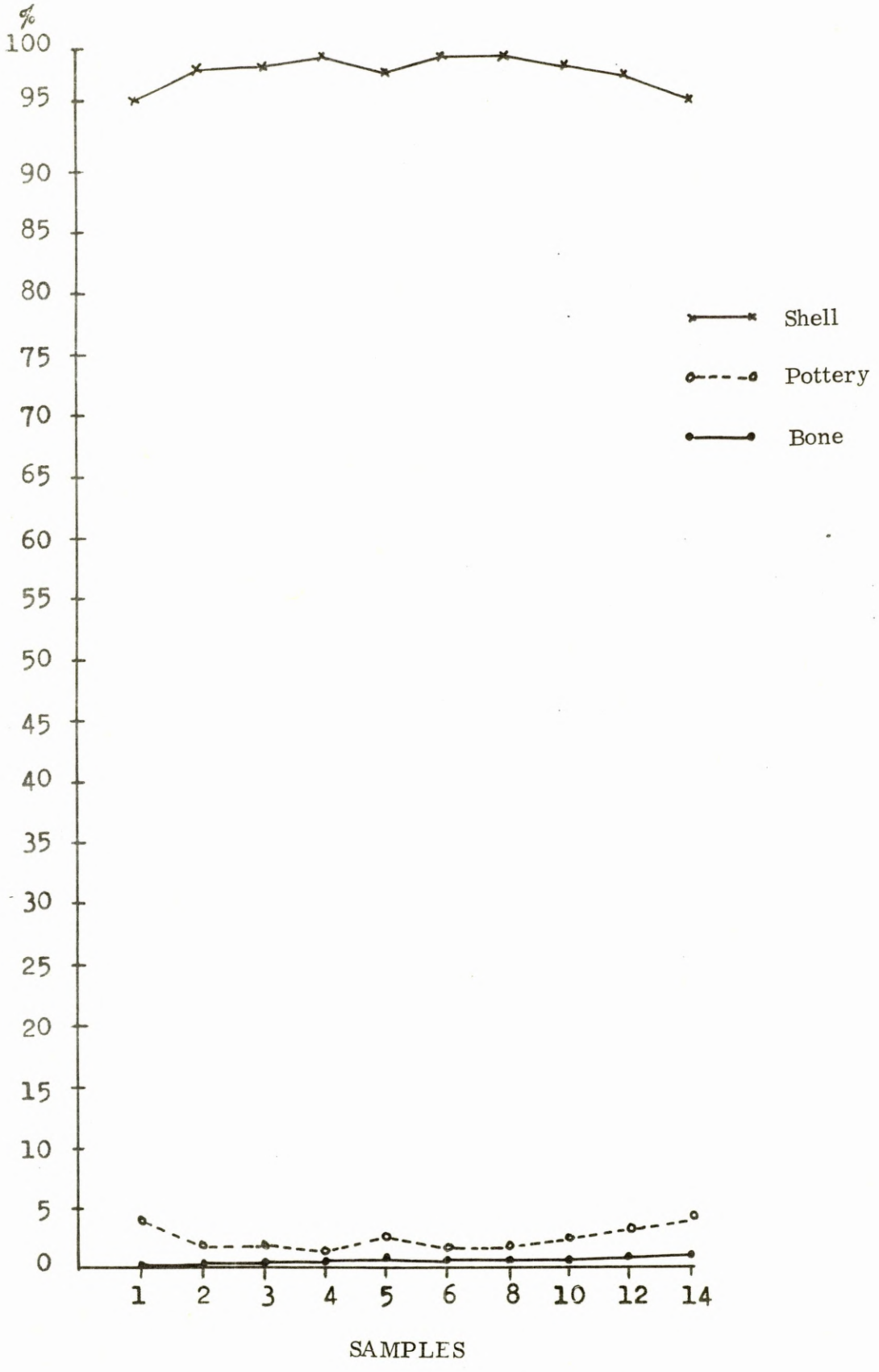



Figure VI. 1 Relative size and distribution of major Components in selected samples from Midden A (expressed in percentage)

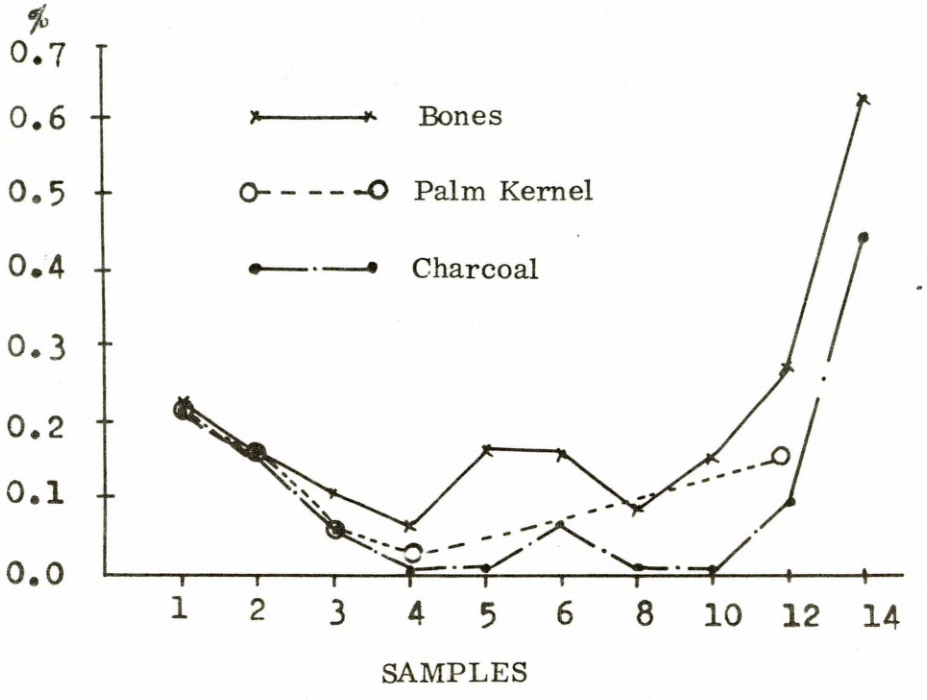



Figure VI. 2 Distribution of Organic Components selected samples of Midden A, expressed in percentages. (Data from Table VI. 2.)

Table VI.5 Components of Samples from Midden B (Weights in grams)

| Sample No. | Shell (g) | Pottery (g) | Bone (g) | Charcoal (g) | Palm Kernel (g) | Burnt Clay (g) | Sand (g) | Total Dry Wt (g) | Total Wet Wt (g) | Moisture (g) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2,050 | 7 | 0 | 0 | 0 | 0 | 1,250 | 3,307 | 3,400 | 93 |
| 2 | 1,600 | 14 | 0 | 0 | 0 | 0 | 600 | 2,214 | 2,500 | 286 |
| 3 | 1,250 | 40 | 0 | 0 | 0 | 0 | 1,500 | 2,790 | 3,100 | 310 |
| 4 | 650 | 130 | 0 | 0 | 10 | 0 | 2,500 | 3,290 | 3,400 | 110 |
| 5 | 2,025 | 59 | 0 | 0 | 0 | 0 | 1,300 | 3,384 | 3,500 | 116 |
| 6 | 1,800 | 115 | 4 | 4 | 0 | 0 | 1,250 | 3,173 | 3,300 | 127 |
| 7 | 130 | 150 | 0 | 0 | 0 | 0 | 1,250 | 1,740 | 2,504 | 764 |
| 8 | 380 | 110 | | 0 | 0 | 0 | 2,800 | 3,290 | 3,400 | 110 |
| 9 | 1,300 | 60 | 0 | 0 | 0 | 0 | 1,000 | 2,360 | 3,000 | 640 |
| 10 | 990 | 70 | | | 10 | 0 | 1,551 | 2,621 | 2,650 | 29 |
| 11 | 539 | 0 | | | 0 | 0 | 1,700 | 1,939 | 2,000 | 61 |
| 12 | 388 | 0 | | | 0 | 0 | 1,962 | 2,350 | 2,600 | 250 |
| 13 | 485 | 5 | | | 0 | 0 | 1,925 | 2,415 | 2,500 | 85 |
| 14 | 920 | 10 | | | 0 | 0 | 1,000 | 1,930 | 2,000 | 70 |
| 15 | 2,100 | 82 | | | 0 | 0 | 200 | 2,382 | 2,400 | 18 |
| Total | 16,867 | 852 | 4 | 4 | 20 | 0.0 | 21,437 | 39,185 | 42,254 | 069 |
| Mean | 1,124.47 | 56.8 | 0.27 | 0.27 | 1.33 | 0.00 | 1,429.13 | 2,612.33 | 2,816.93 | 204.60 |
| % Mean | 95.1 | 4.73 | 0.02 | 0.02 | 0.08 | 0.00 | 54.71 | 92.74 | | 7.26 |

Table VI.6 Components of Samples from Midden C (weights in grams)

| Sample No. | Shell (g) | Pottery (g) | Bone (g) | Charcoal (g) | Palm Kernel (g) | Burnt Clay (g) | Sand (g) | Total Dry Wt (g) | Total Net Wt (g) | Moisture (g) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1,250 | 6 | 7 | | 0 | 0 | 900 | 2,163 | 2,200 | 37 |
| 2 | 2,220 | 0 | 10 | 0 | 0 | 0 | 160 | 2,390 | 2,450 | 60 |
| 3 | 2,410 | 0 | 0 | 0 | 0 | 0 | 200 | 2,610 | 2,700 | 90 |
| 4 | 1,230 | 0 | 35 | | 0 | 0 | 2,100 | 3,365 | 3,400 | 35 |
| 5 | 2,450 | 164 | | 0 | 0 | 0 | 160 | 2,774 | 2,800 | 26 |
| 6 | 1,700 | 0 | | 0 | 0 | 0 | 80 | 1,780 | 1,800 | 20 |
| 7 | 1,040 | 70 | 10 | 0 | 0 | 0 | 1,000 | 2,120 | 2,300 | 180 |
| 8 | 750 | 290 | 4 | 0 | 0 | 0 | 800 | 1,844 | 1,860 | 16 |
| 9 | 1,325 | 116 | 18 | 0 | 0 | 0 | 900 | 2,359 | 2,400 | 41 |
| 10 | 909 | 220 | 15 | 0 | 2 | 0 | 2,000 | 3,146 | 3,200 | 54 |
| 11 | 1,052 | 193 | 26 | 0 | 11 | 0 | 820 | 2,102 | 2,200 | 98 |
| 12 | 1,652 | 90 | 3 | 0 | 0 | 0 | 320 | 2,065 | 2,100 | 35 |
| 13 | 1,800 | 6 | 14 | 0 | 0 | 0 | 1,000 | 2,820 | 3,400 | 580 |
| 14 | 1,570 | 8 | 3 | 0 | 0 | 0 | 1,400 | 2,981 | 3,100 | 119 |
| 15 | 1,103 | 35 | 40 | 0 | 0 | 0 | 500 | 1,678 | 2,000 | 322 |
| Total | 22,461 | 1,198 | 185 | 0.0 | 13 | 0.0 | 12,340 | 36,197 | ,910 | 1,713 |
| Mean | 1,497.40 | 79.87 | 12.33 | 0.00 | 0.87 | 0.00 | 822.67 | 2,413.13 | 2,527.33 | 114.2 |
| % Mean | 59.24 | 3.16 | 0.49 | 0.00 | 0.03 | 0.00 | 32.55 | 95.48 | | 4.52 |

Table VI.7 Components of Samples from Midden D (weights in grams)

| | Shell (g) | Pottery (g) | Bones (g) | Charcoal (g) | Palm Kernel (g) | Burnt Clay (g) | Sand (g) | Dry Weight (g) | Wet Weight (g) | Moisture (g) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1,040 | 66 | 0 | 0 | 0 | 0 | 1,100 | 2,206 | 2,600 | 394 |
| 2 | 1,700 | 113 | 0 | 0 | 0 | 0 | 900 | 2,713 | 2,800 | 87 |
| 3 | 1,650 | 200 | 0 | | 0 | 0 | 1,160 | 3,010 | 3,100 | 90 |
| 4 | 1,200 | 160 | 45 | 0 | 0 | 0 | 850 | 2,255 | 2,400 | 145 |
| 5 | 548 | 0 | 0 | | 0 | 0 | 1,300 | 1,848 | 2,600 | 752 |
| 6 | 1,270 | 200 | 0 | | 0 | 0 | 1,400 | 2,870 | 3,000 | 130 |
| 7 | 1,150 | 325 | 0 | | 0 | 0 | 1,000 | 2,475 | 2,500 | 25 |
| 8 | 950 | 190 | 0 | | 0 | 0 | 450 | 1,590 | 1,800 | 210 |
| 9 | 1,300 | 492 | 0 | 0 | 0 | 0 | 500 | 2,292 | 2,300 | 8 |
| 10 | 1,880 | 6 | 0 | | 0 | 0 | 1,100 | 2,986 | 3,100 | 114 |
| 11 | 1,450 | 80 | 0 | | 0 | 0 | 800 | 2,330 | 2,400 | 70 |
| 12 | 750 | 140 | 0 | 0 | 2 | 0 | 650 | 1,542 | 1,700 | 158 |
| 13 | 1,120 | 110 | 0 | | 0 | 0 | 1,200 | 2,430 | 3,000 | 570 |
| 14 | 1,110 | 30 | 8 | | 0.0 | 20 | 800 | 1,968 | 2,200 | 132 |
| 15 | 1,260 | 101 | 1 | | 0.0 | 0 | 950 | 2,312 | 2,400 | 88 |
| 16 | 750 | 420 | 0 | | 6 | 0 | 500 | 1,676 | 2,700 | 1,024 |
| 17 | 1,250 | 0 | 2 | | 0.0 | 0 | 1,400 | 2,652 | 2,800 | 148 |
| 18 | 1,807 | 14 | 0 | | 0.0 | 0 | 650 | 2,471 | 2,900 | 429 |
| 19 | 1,570 | 61 | 0 | 1 | 0.0 | 20 | 100 | 1,752 | 1,800 | 48 |
| 20 | 850 | 577 | 1 | | 4 | 0 | 900 | 2,332 | 2,350 | 18 |
| 21 | 1,580 | 0 | 5 | | 1 | 0 | 340 | 1,926 | 2,100 | 174 |
| 22 | 940 | 240 | 1 | | 0 | 23 | 340 | 1,544 | 1,700 | 156 |
| Total | 27,125 | 3,464 | 63 | | 11 | 43 | 18,290 | 48,996 | 53,966 | 4,970 |
| Mean | 1,232.9 | 157.46 | 2.86 | | 0.50 | 1.95 | 831.36 | 2,227.1 | 2,453.1 | 325.90 |
| %Mean | 58.2 | 7.1 | 0.13 | | 0.02 | 0.08 | 37.35 | 90.8 | | 9.21 |

Bones of land and sea creatures are not consistent in their composition and so survive only differentially. It is not convincing to explain this on sample size as there appears to be marked consistency in the presence of bones in each sample within middens A and C sampled by different methods. However, it is worth noting that though a case of inconsistency exists which in fact reduces the chances of predicting the probability of occurrence, bone traces were noted for almost all of the samples from each midden. The problem lay not in occurrence but in the size and morphology. It is recommended therefore that a presence or absence case be made for components like bones, especially if comparative descriptive statements are expected for the entire midden or sample components (See Figure VI.2).

Charcoal like bones evinces a high degree of variability in survivial which is accountable from the fact that much of it is crushed between other components, sticks to them or disintegrates into powder and mixes with the residue. These problems of recovery make it necessary, from calculations based on absolute weights and percentages, that a presence or absence must be entered for charcoal to facilitate comparative descriptive analysis.

Palm kernels were present in each of the middens as the samples show though they are erratic in their appearance. They cannot be treated like bones and charcoal although, like the other components they were fairly stable in their form when recovered from the midden. But if they are erratic in their occurrence within the samples taken from the middens, they are at least consistent in their percentage composition within the four shell middens (See Table VI.8).

Metal was only recovered from the topmost spit of midden A and did not occur in any of the other samples within midden A or the other three middens. The consistency appears to be mutually agreeable and to rule out sampling error.

Burnt clay was recovered from two samples from midden A and three from midden D, in short in five samples out of 67 or 7.5% of the entire samples. Its recovery is therefore more of chance as its occurrence is not consistent in the middens.

An observation must be made from the presentation of these sets of data. The disadvantage of a summary table like Table VI.8 is that it masks the finer details, variations and inconsistencies which are associated with samples and raw data. This made is essential for the study to present the raw data from field studies and the summary statistics where these are helpful.

3. Dietary Analysis

Three components of the middens—plant remains, shell and bones—allow the study of diet. Earlier studies (Nelson 1909; Gifford 1949; Cook 1946; Meighan 1958) have viewed diet in terms of nutritive value of the midden food components expressed as protein. Shawcross (1967) relied more on energy returns expressed as calories than on protein values.

It has been stated in Chapter III that from our field observations and the dietary studies of Dr. Nicol (1952), human groups in the delta engaged in traditional subsistence activities today place more emphasis on the weight

Table VI.8 Breakdown of Four Midden Components Expressed as Percentages

| Midden | Sample No. | Shell % | Pottery % | Bone % | Charcoal % | Palm Kernel % | Metal % | Burnt Clay % |
|---|---|---|---|---|---|---|---|---|
| A | 15 | 98.15 | 1.57 | 0.19 | 0.04 | 0.03 | 0.002 | 0.02 |
| B | 15 | 95.10 | 4.73 | 0.02 | 0.02 | 0.08 | 0.00 | 0.00 |
| C | 15 | 94.15 | 5.02 | 0.78 | 0.00 | 0.05 | 0.00 | 0.00 |
| D | 22 | 88.34 | 11.28 | 0.21 | 0.00 | 0.04 | 0.00 | 0.14 |
| Total | | 375.74 | 22.60 | 1.20 | 0.06 | 0.20 | 0.002 | 0.16 |
| Mean | | 93.94 | 5.65 | 0.30 | 0.015 | 0.05 | 0.000 | 0.04 |

(Source Tables VI.2, 5-7)

Table VI.9 Shell Species in Samples from Midden A
(weights in grams)

| | Gryphaea (g) | Tympanotonus (g) | Achatinid (g) | Thais (g) | Anadara (g) | Ensis (g) | Semifusus |
|---|---|---|---|---|---|---|---|
| 1 | 15,225 | 240 | 1 | 450 | 60 | 0 | 0 |
| 2 | 19,394 | 650 | 30 | 243 | 843 | 0 | 70 |
| 3 | 37,393 | 1,390 | 99 | 430 | 18 | 0 | 50 |
| 4 | 87,216 | 550 | 1 | 1,105 | 1,620 | 5 | 100 |
| 5 | 18,540 | 263 | 0 | 602 | 452 | 1 | 75 |
| 6 | 53,967 | 801 | 5 | 1,105 | 1,441 | 31 | 0 |
| 7 | 16,437 | 251 | 1 | 242 | 402 | 71 | 0 |
| 8 | 43,745 | 757 | 3 | 1,252 | 2,100 | 117 | 0 |
| 9 | 37,707 | 720 | 30 | 940 | 730 | 160 | 0 |
| 10 | 63,621 | 1,114 | 60 | 1,469 | 1,810 | 250 | 0 |
| 11 | 2,241 | 431 | 5 | 320 | 755 | 341 | 140 |
| 12 | 9,506 | 61 | 20 | 200 | 381 | 12 | 0 |
| 13 | 6,142 | 151 | 20 | 191 | 221 | 679 | 0 |
| 14 | 5,470 | 210 | 60 | 100 | 200 | 80 | 0 |
| 15 | 5,330 | 280 | 20 | 50 | 350 | 70 | 0 |
| Total | 442,103 | 11,748 | 355 | 11,579 | 18,179 | 1,886 | 695 |
| Mean | 29,474 | 783.2 | 23.7 | 771.9 | 1,211.9 | 125.7 | 46.3 |
| Mean% | 90.85 | 2.41 | 0.07 | 2.38 | 3.98 | 0.39 | 0.14 |

of their food intake, seen in energy terms calculated in the quantity of calories. We are using this observation as an initial working hypothesis to be tested by evidence from the shell midden analysis.

Computations of the dietary value of shells and bones and therefore the evaluation of the relevance of these materials to the food economy of the culture follow four steps: the calculation of the total weight for each of the components under study for the entire midden; the conversion of these weights to edible values; the calculation of energy yields by converting these meat weights into calories and/or the calculation of the protein yield of the same weights; the estimation of the length of utilisation of the midden and therefore its age. Each stage of the computation is fraught with its own problems of transferring raw data, of converting values from one unit to another, the lack of absolute values for certain elements, the lack of relevant nutritional and energy values in parts of the area under study and reliance on data from elsewhere. While these may introduce margins of error to the calculations, statistical margins of accuracy are used where necessary, and it is advisable therefore to approach the calculations with caution while evaluating the study on its methodological approach and its contribution to the range of interpretations it opens to the archaeologist.

a) Shellfish

Shell comprised 98.15% of total midden A components or the equivalent of 302,429.6 kg. The shell species making up this weight differ in individual weights and quantity. Table VI.10 sets out the weights of selected shellfish found in the field. These weights have been used along with Table VI.9 to arrive at Table VI.11, the weights of shellfish represented in midden A in terms of total species weight, individuals, individual live weight, meat weight per individual and therefore total meat weight which is of concern to the analysis. Some adjustment appears necessary for the figures for Gryphaea sp. a species that fractures quite easily and sticks to the silt or other residue even after drying. As this is mainly for the figures obta ined for the 2 mm screen a -10% for that screen would be adequate or a -3.37% for the entire Gryphaea. But the figures could be used without adjustment to compensate for chemical wear on Gryphaea shells reducing their weights by 3-5% in some cases. In consequence therefore the figures for Gryphaea are used without adjustment.

An observation concerning the values of shellfish is that some species offer more per individual than others in live weight, for instance, Anadara senilis, Thais sp. and Gryphaea weigh more than Archachatina sp. but the last contains more meat weight per individual. This variation affects total meat weight represented by the shells within the midden.

From Table VI.11 the total meat weight from the shells is 34,973.3 kg for midden A. Energy values of 48, 50 and 66 calories per 100 grams have been calculated for cockles, oysters and mussels respectively (McCance and Widdowson 1960) while they have been given an overall figure of 82 calories per 100 gms based on work in Australia (Osmond and Wilson 1961). This discrepancy is explained by Shawcross (1967: 122) who used a correction factor of 65 $\pm$15 calories per 100 gms as an overall calculation figure. Bailey's (1975) Table III.2 based on various sources (Diem 1962; McCance and

Table VI.10 Weights of Some Contemporary Shellfish Species in the Niger Delta

| Species | No. of Individuals | Total Live Weight (gm) | Total Shell Weight (gm) | Total Mean Weight (gm) | Mean Indiv. Live Wt. (gm) | Mean Indiv. Meat Wt. (gm) |
|---|---|---|---|---|---|---|
| Oyster (Gryphaea) | 33 | 1,650 | 1,452 | 198 | 56 | 6 |
| Periwinkle (Typanotonus fuscatus) | 136 | 544 | 429 | 115 | 4 | 0.85 |
| Land Snail (Achatinidis) | 10 | 200 | 66 | 134 | 20 | 13.4 |
| Whelk (Thais) | 19 | 950 | 720 | 230 | 50 | 12.11 |
| Cockle (Anadara (Arca) Senilis) | 8 | 592 | 512 | 80 | 74 | 10 |
| Clam (Ensis siliqua) | No contemporary species available | | | | | |
| Dilated whelk (Semifusus sp.) | No contemporary species available | | | | | |

Table VI.11 Weights of Shellfish from Midden A (weights in gms)

| Species | % of Tot. wt. in Midden | Total Shell Weight (g) | Indiv. Live Weight (g) | Total no. of Indiv. rep. | Meat Per Indiv. (g) | Total Meat Weight (g) |
|---|---|---|---|---|---|---|
| Gryphaea sp. | 90.85 | 274,757,280 | 56 | 4,906,380 | 6 | 29,438,280 |
| Anadara sp. | 3.98 | 12,036,710 | 74 | 162,658 | | 1,626,582 |
| Tympanotonus sp. | 2.41 | 7,288,600 | 4 | 1,823,972 | 0.85 | 1,550,376 |
| Thais sp. | 2.38 | 7,197,830 | 50 | 143,956 | 12.11 | 1,724,479 |
| Achatinid | 0.08 | 241,940 | 20 | 12,097 | 13.4 | 162,099 |
| *Ensis sp | 0.39 | 1,179,480 | 6 | 196,580 | 2 | 393,160 |
| *Semifusus sp. | 0.14 | 423,400 | 74 | 5,378 | 14 | 75,301 |
| Total | | 303,124,240 | 284 | 7,251,022 | 58.36 | 34,973,278 |
| Mean | | 43,034,463 | 40.6 | 1,035,860 | 8.3 | 4,996,183 |

*Extrapolated from weights of shells recovered from the midden.

Widdowson 1960; Townsend 1967; Tressler and Lemon 1951) and his field observation give caloric values for six different species of mollusca the mean of which is 70.5 calories per 100 gms raw weight. A combination of these various sources give a mean figure of about 72 calories $\pm$ 5% per 100 gms on which the present study will be based. Observations in the field show that average shell weights were higher from samples from the middens than from average shell weight from present day shell samples. This has obvious implications for exploitation patterns which will be taken up below. Suffice it to say that this observation was widespread in all the species and in fact in all parts of the delta studied. This is perhaps because the shellfish represented in the middens were exploited when fully mature while those of today have not been given the opportunity to mature because of intensive exploitation.

Computing for total energy in calories contributed by shellfish we have

$$\begin{aligned}\text{Total energy} &= \text{total meat wt x calorie per 100 gram} \\ &= 34,973,279 \times \frac{72}{100} \\ &= 25,180,767 \text{ calories}\end{aligned}$$

b) Bones

i) Fish: Among parts of fish identified were opercular bones, skulls, otoliths, thoracic, dermal, jaw bones, spines ar fins, pectoral and anal fins. Only two species—croakers and catfish—were said to be present with a degree of certainty (Inyang: pers. comm. 1977). A decapod (crab) shell was identified and fragments of turtle shell and bone were also identified. Ovicaprid and rodents were represented. (Reece: pers. comm. 1978).

ii) Mammals: Other bones not identified with any specific animal are teeth, jaw bones, thoracic vertebrae, scapula bones. Our major problem in using these bones in our dietary analysis is that they have not been identified with specific fish or animal species thereby making it difficult to assign values to the bones. Beyond this we do not know the proportional representation by fish and animal/birds. The potential errors in quantification arising from this situation must therefore be appreciated.

However Cook and Treganza (1950) have established that a relationship exists between edible flesh and bone weights in the ratio of 20:1. But because of the loss of organic constituent due to slow oxidation through the years of burial and bacterial action, a further reduction is said to be introduced into the bone weight of about 5% (Cook and Treganza 1947: 138; 1950; 245) bringing the ratio to 20 $\pm$ 5%:1 (edible flesh to bone). But this estimate thus far assumes that the represented bones were only animal and bird. A further 3% must be added to the ratio if fish is being considered (i.e. 20 $\pm$ 8%:1 flesh to bone). A final adjustment which must be made in these figures concerns the amount of bone lost through various ways—scavenging by wild animals and dogs, differential preservation, throwing away—and the proportion of the bones eaten as edible parts of the animal or fish. These are said to be equal to the portaion perserved in the archaeological context (Cook and Treganza 1950: 247) which requires that the quantity be doubled. Put in a computational formula so far

Total energy = Total Bone wt x flesh ratio + adjustment percentage x double factor (2) x caloric value

or $E = Bw \times fr + Ap \times Df \times Cv$

However Nicol's observations (Table III.4) and the excavated bones show that the culture must have been more marine oriented in terms of procuring animal meat (shellfish, fish, mammal, bird) in that total fish/shellfish meat compares to the mammal/bird meat in the form of 75% to 25%. There is no reason why the fish/shellfish figure could not have been higher in the past considering that the number of people per unit area of exploitation was definitely less than today though the incidence of advanced technology must be considered. This observed relationship must be reflected in the calculations and this enables the study to differentiate between the contributions by the two resources.

In energy terms, McCance and Widdowson (1960: 47) give a caloric value of 127 for 100 grams of fish meat while Osmond and Wilson (1961: 13) give a value of 103 for 100 gms a variation between the two values being accounted for by variety in age, species, season of the year, locality, quality of the fish (Shawcross 1967: 120); factors that are extremely difficult to assess and control. A conversion error of $\pm$ 5% added to the mean of these figures (115 calories per 100 gms) will be used for the present calculations.

For fish therefore

$$E = Bw \times Fr + Ap \times Df \times Cv$$
$$= 574,620 \times \frac{75}{100} \times 20 + 8\% \times 2 \times \frac{115}{100} \pm 5\%$$
$$= 21,410,341 \pm 5\% \text{ calories}$$

Diem (1961) gives a calorific value of 139 calories per 100 grams of deer which is an animal in the wild. Other caloric estimates for animals by Diem (1962) and Osmond and Wilson (1961) are respectively for medium fat ox and pork, animals which are different from animals in the wild. Ziegler (1973: 30) gives an average of about 200-2200 calories per 100 gm of meat for wild animals. The mean of Ziegler's lowest and highest values plus Diem's values for deer (200 + 220 + 139 ÷ 3) which is 187 will be used for the calculations corrected to $\pm$ 5% from animal/bird.

$$E = Bw \times Fr + Ap \times Df \times Cv \pm 5\%.$$
$$= 574,620 \times \frac{25}{100} \times 20 + 5\% \times 2 \times \frac{187}{100} \pm 5\%$$
$$= 11,605,025 \pm 5\% \text{ calories}$$

To crosscheck our computations it has become necessary to assume that bones possibly represented either fish or animal/bird and to calculate the total caloric value in such terms then to add the two computations with the total obtained for fish and animal/bird as 75% and 25% of the bone representations and finally to find the mean of these three sets of computations. If fish only were represented the total calories would be 28,547,121 and if only animal/bird the total would be 45,130,645 and if fish and animal/bird in proportion the caloric value would be 33,015,366 $\pm$ 5%. The sum of the three

values has a mean of 35,564,378 . A difference of 2,549,014 exists between this mean and the total of the proportional computation to the scale of ± 7%. It does therefore seem that this margin of error compares well with the calculated error of ± 5% already attached to the proportion of computation. In short 33,015,366 ± 5% will be accepted as a reasonable estimate.

4. Estimation of Midden Age

Nutritionists recognize that the body energy requirements override other considerations in the way the body utilizes the components of a diet. Food values are a function of the weight of the food or the amount of energy it is capable of producing in sustaining body and physical operations of the individual. This in no way underestimates the importance of nutrients in the upkeep of the body. But the basic physiological fact has to be faced. This issue was put in the form of a hypothesis at the beginning of the section on dietary analysis.

The daily calorie requirement of a moderately active adult is considered to be 2000 (Diem 1962, Bender 1968) and Nicol (1952) obtained a figure of 2,191 for an adult delta fisherman. These figures are mutually agreeable and have been approximated to 2100 cal per day for computations below. If it is assumed that the midden was the result of an individual's action, and that for the duration of its accumulation it was added to daily, and that the rate of accumulation was uniform, it will be seen that if this individual depended entirely on shellfish, animal/bird and fish for the supply of his daily energy requirements throughout the duration of the midden accumulation, the midden would have taken

58,951 2100 man/days

28,072.2 days or 76.9 years

to accumulate.

It is not known whether the midden accumulated in only 76.9 years and whether it was in fact the action of an individual alone. It is equally not known whether the individual subsisted entirely on animal meat and that no other source of food was available to him or that he failed to utilize the abundant wild vegetable food resources available in Okochiri. It is reasonable to suggest however that he exploited the vegetable resources. It might perhaps be helpful if for argument purposes we use the evidence of the data in another way, this time by considering that the represented animal food satisfied protein rather than caloric requirements.

Diem (1962) and Bender (1968) give a minimum daily protein requirement of 50 gms. Nicol (1952) obtained a figure of 69 grams for animal protein in the daily diet of a delta adult. Ordinarily this figure is very high but it must be realized that being situated at the source of protein resource was in itself an opportunity for taking more than the minimum requirement. If however we assume again that the midden accumulation was uniform, was the responsibility of one individuala and that for the duration of its accumulation it was not abandoned and that the individual during the same period depended entirely on shellfish, fish and animal/birds to satisfy the protein requirements, then the midden would have taken

$$\frac{\text{(the sum of the fish, shellfish, animal/bird meat}}{\text{daily protein intake)}}$$

$$\frac{(34973279 + 6205896 + 18617688)}{68}$$

i.e.

= 879,365.6 or 2,409.2 years

to accumulate.

The discrepancy between the figures arrived at through these two approaches is crucial to the interpretation of shell middens with reference to their representative contributions to the diet of the populations responsible for their accumulation. But first let us consider some other facts observed at Okochiri in the course of the field studies. The population at Okochiri varied from time to time with subsidiary settlement and return of individuals. The interval between these two activities of out-radiations and returns varied between a few hours in a given day, through days in a week or weeks in a given month, to some taking months. At no time within the months of November 1976 to April 1977 or when the site was revisited at intervals in the months of July and August 1977 were there more than ten people at the site although a population of about 16 was noted in the entire period of the study. However 8 was the active member of the site made up of three children and five adults. Table VI.13 summarizes estimates of population and length of time the meat would have supported if used as the main source of energy (calories) or if used as a protein. What is clear is that the age is under estimated even using the protein factor for the computations. This seems to rule out the possibility of the meat resource being used as a major energy supplier in the diet. An explanation must therefore be sought from other sources for the major food source in Okochiri.

5. The Unknown Factor

The range of food resources utilized at Okochiri which cannot be traced from the midden component may be referred to as the unknown factor. In all the parts of the delta visited during the fieldwork it was clear that a very high proportion of the daily food intake consists of vegetable and plant foods. Data obtained by the present writier in 1976/77 (Nzewunwa 1979) shows the various plant resources utilized by the people in the delta today and some in the past. Dr. Nicol (1952) also listed possible plant foods utilized by the delta community he studied. Comparison of data from Nzewunwa (1979: 429-30) and Table III.4 shows that about 80% of the delta diet is composed of vegetable /plant foods. Even 15% of the daily protein intake is accounted for by vegetable resources (Nicol 1952). See Tables III.6, VI.14.

Different positions have been attached to shellfish as a food resource in one part of the world or the other. Studies in America (Cook and Treganza 1950; Meighan 1969) and in New Zealand (Shawcross 1967, 1970) treat it as a major food resource though the latter considers it on seasonal basis. In Europe shellfish exploitation is regarded as a chance activity (Bailey 1975) although that it may have been a major food resource at some point in human history has also been suggested (Evans 1969). Dietary analysis of the nature

Table VI. 12 Energy Values for Food Resources in Midden A

| | |
|---|---|
| Fish | 21,410,341 ± 5% |
| Animal/bird | 11,605,025 ± 5% |
| Shellfish | 25,936,183 ± 5% |
| Total | 58,951,549 ± 5% |

Table VI. 13 Population and Age Estimates Represented by the Meat Weight from Midden A if used as Major Food Source (Calories) or as a Subsidiary (Protein)

| Population | 1 yr | 3 yrs | 5 yrs | 8 yrs | 10 yrs | 12 yrs | 15 yrs |
|---|---|---|---|---|---|---|---|
| Major Food (Calories) | 76.9 | 25.6 | 15.4 | 9.6 | 7.7 | 6.4 | 5.1 |
| Subsid. Food (Protein) | 2409.2 | 803.1 | 481.8 | 301.2 | 240.9 | 200.8 | 160.6 |

Table VI. 14 Percentage Composition of Major Nutrients of Food of Two Niger Delta Groups

| | ILLU farmers | | Soragbemi fishermen | |
|---|---|---|---|---|
| Nutrient | % total cal. | % wt. of diet | % total cal. | % wt. of diet |
| Protein | 7.7 | 8.4 | 14.6 | 16.1 |
| Fat | 17.0 | 8.4 | 16.4 | 7.8 |
| Carbohydrate | 75.3 | 83.3 | 69.0 | 76.1 |

(Source: Nicol 1952)

undertaken could help to weigh the evidence while ethnographic analogy might also be brought to bear on the issue. A comparison of Tables VI.15 and 16 shows that vegetable plant foods such as the yam and cocoyam yield more in energy and protein value than oysters and would be expected to have contributed substantially in the diet of the Okochiri shellfish collectors. Other factors which account for the discrepancy in our figures are tied up with disposal mechanism for the bones and shells, the duration and manner of occupation of the site at any one time (Ch. VII) and the people's food habits.

6. Human Exploitation and Dietary Habits

As a predator man has the ability to calculate his predatory strategy to maximize his turnover but he also has the ability to, and at times does, insure that the exploited population persists on a sustained basis (Anderson 1975, Slobodkin and Richman 1956, see also Chapter III). The effect of human predation on animal populations generally referred to under the optimum yield theory in biology states that in fishing, shellfish collecting, and hunting activities total mortality increases with increased exploitation pressure (Gullard 1971).

Some of the principles of the optimum yield theory might perhaps help to explain some observed arcaeological situations in the shell middens as they bear direct relevance to human exploitation strategies. The archaeological evidence suggests that Anadara senilis was available in an appreciable quantity in the sites of Ogoloma, Ke and Okochiri. Results from field studies indicate that this resource is scarce today but emphasize that it was a highly valued food resource in the past and was equally available. It is likely that, as the local people believe and supported by the optimum yield theory, this resource was exploited to a point where extinction set in in some areas.

In the Brass-New Calabar Rivers complex shellfish was never exchanged for other materials in the past. It was given freely but with the development of exchange relations beyond this complex and the growth of the population, exploitation was bound to exceed the limits within which natural biological increase could maintain the species.

In reaching conclusions about the level of exploitation and dietary habits it is well worth the while to understand the biology of particular species of the animal population being studied. Only by so doing would it be possible to recognise the absence of a species arising from haphazard exploitation strategies and to differentiate it from the absence arising from dietary preference. It has been usual to consider the absence of a shellfish species only in terms of dietary preference where perhaps the exploitation strategy and regenerative biology of the animal species may well have been the key factor in the observed situation. Even beyond these lines of interpretation, factors of environment may equally be among the dietary influences.

The introductory biological and environmental constraints on the life of these animals presented in Chapter IV tend to point out that the oyster was a dominant shellfish in the diets of most delta people. This situation is quite different in the middle Brass River region of Nembe (Onyoma site) where the periwinkle Tympanotonus sp. thrives very well in the mud flats (see Fig. IV.6). Anadara senilis is a preferred shellfish but the archaeological evidence does not support this because the occurrence of this species is not as prolific as those

Table VI-15 Nutrient Composition of Crustacea/Shellfish

| | Measure | Weight | Moisture | Calories | Protein | Fat | Saturated Fatty acid | Carbohydrate | Calcium | Iron | Vitamin A | Vitamin B1 | Vitamin B2 | Niacine | Ascorbic Acid (Vitamin C) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | oz | gm | % | kcl | gm | | | gm | mg | mg | lu | mg | mg | | |
| Clams | 3 | 85 | 86 | 45 | 7 | 1 | | 2 | 47 | 3.5 | | 0.01 | 0.09 | 0.9 | |
| Crabs | 3 | 85 | 77 | 95 | 15 | 2 | | 1 | 38 | 0.7 | | 0.07 | 0.07 | 1.6 | |
| Lobster (Boiled) | 1 | 334 | 77 | 308 | 20 | 25 | 12 | 1 | 80 | 0.7 | 920 | 0.11 | 0.06 | 2.3 | |
| Oyster (raw meat only. Medium size 13-14 oz. | 1 cup | 240 | 85 | 160 | 20 | 4 | | 8 | 226 | 13.2 | 740 | 0.33 | 0.43 | 6.0 | |
| Shrimp (raw, 20 small) | 2/3 cup | 100 | 70 | 91 | 19 | 1 | | 2 | 63 | 1.6 | 0.0 | 0.02 | 0.03 | 3.2 | |
| Cockle b | | 100 | 78.9 | 48 | 11.0 | 0.5 | | 3.4 | 127 | 2.6 | | | | | |

Adapted from Wavell n.d. p. 28
b Bailey 1975 Table III.2

Table VI·16 Nutrient Composition of Selected Food Resources per 100 gram

| | Calories | Protein (%) | Protein per 100 cal. (g) | Calcium (mg) | Iron (mg) | Vit. A. I.u. | Thiamine (Vit B1) (mg) | Riboflavin (Vit B2) (mg) | Niacin (mg) | Ascorbic Acid (Vit C) (mg) |
|---|---|---|---|---|---|---|---|---|---|---|
| Yam (Dioscorea sp)[a] | 90 | 2.1 | 23.3 | 19 | 0.7 | | 0.08 | 0.03 | 0.4 | 9 |
| Cocoyam (Colocasia sp)[a] | 86 | 1.5 | 17.4 | 19 | 0.9 | | 0.12 | 0.02 | 0.7 | 4 |
| Cassava (Manihot ulitiss.) fresh[a] | 109 | 0.9 | 8.3 | 25 | 0.5 | | 0.04 | 0.02 | 0.04 | 27 |
| meal and flour[a] | 338 | 1.5 | 4.4 | 12 | 1.0 | | 0[b] | 0 | 1.0[b] | 0 |
| Plantains (Musa paradisicca)[a] | 75 | 0.8 | 10.7 | 5 | 0.5 | 220 | 0.04 | 0.03 | 0.4 | 11 |
| Bananas (Musa sapientium)[a] | 71 | 0.8 | 11.3 | 6 | 4 | 180 | 0.03 | 0.03 | 0.5 | 9 |
| Sweet potatoes (Ipomea batatas)[a] | 97 | 1.1 | 11.3 | 28 | 0.8 | 420 | 0.08 | 0.04 | 0.5 | 19 |
| Maize (Zea mays)[a] | 360 | 9.3 | 25.8 | 6 | 1.8 | 400 | 0.35 | 0.09 | 1.3[b] | 0[b] |
| Rice (Oriza sp brown)[a] | 357 | 7.5 | 21.0 | 15 | 1.4 | 0[b] | 0.33 | 0.05 | 4.6 | 0[b] |
| Oysters[c] | 59 | | 9.4 | 124 | 6.0 | 350 | 0.14 | 0.19 | | 5.50 |
| Deer[c] | 139 | | 22.8 | 11 | 3.0 | | | | | |
| Salmon[c] | 180 | | 20.0 | 40.0 | 1.2 | 100 | | | | 0.0 |

Data from: a FAO (1954) b Inputed by Johnston 1958: 160 c Bailey 1975 Table III.2

of the oyster or the periwinkle. That its exploitation quickly outpaced its regenerative potential and even led to its depletion in some areas is embedded in the archaeological record which registers its availability in some sites, for instance, at intervals at Okochiri, in most levels at Ogoloma but with reducing numbers at Ke. The case does not seem to be one of dietary preference unless we totally reject the ethnographic evidence. Thais sp. appear in abundance in the archaeological situations in mangrove areas east of Brass River and close to the open sea (Saikiripogu), but restricted occurrence in the landward zones, for example, in Okochiri and Ogoloma, must be interpreted in terms of the ecology and the biology of the species.

Other aspects of this study which may help to understand the methods of exploiting the shellfish, fish, animal and plant resources in the delta are presented in Chapter VII. So far it appears from the detailed analysis of shell midden A and the comparison of the results with the quantitative data from middens B, C, and D aided by ethnographical observation from the study area that although shells are most abundant in the middens and that although the middens also contain a substantial amount of animal and fish bones, their caloric value does not satisfy the energy requirements for the projected number of contributors to the midden sites for the period of their utilization (see Chronology, Chapter X). Although seasonality can be said to account for part of this discrepancy the seasonal factor (Ch. VII) is not of the nature observed in temperate regions for shellfish collectors. The evidence although indirect suggests the utilization of vegetable food resources as the main staple.

7. Dry and Wet Screen Size

In analysing samples of a midden, screen size is important as this not only affects the quantity of material recovery but also the time and labour involved in the analysis. In none of the excavated African shell middens is there a comment on the effect of screen size on the material. In America screen size considered appropriate for midden analysis has varied from 1/4 inch (approx. 6 mm) (Greenwood 1961: 418) through 1/8 inch (approx. 3 mm) to 1/16 inch (approx. 2 mm) (Ascher 1959) and in New Zealand the choice of screen has varied from 1/2 inch through 1/4 inch to 1/8 inch (Davidson 1964; Smart 1962). It would be reasonable to consider the use of minimum screen size only in relation to the nature of midden component and the nature of the particular research objectives.

In this study four screen sizes in all were used. In the analysis of midden A three sizes of screen, 25 mm, 12 mm, and 2 mm, were used. The choice of large screen sizes was dictated primarily by the size of samples (all material within the test area 2 m x 2 m x 0.15 metres) and the fact that the midden was damp and the components had quantities of earth adhering to them. The use of the 2 mm screen was a compensation for small components as well as the shells that fractured easily. In analysing the same size of samples from middens B, C, and D a task undertaken in the laboratory after weeks of drying, all the four screen sizes were used. The difference between the samples sieved in the field and those processed in the laboratory lies in the use of the 4 mm in the latter and its absence for the former. The discussion that follows shows observations made on this variation in screen size.

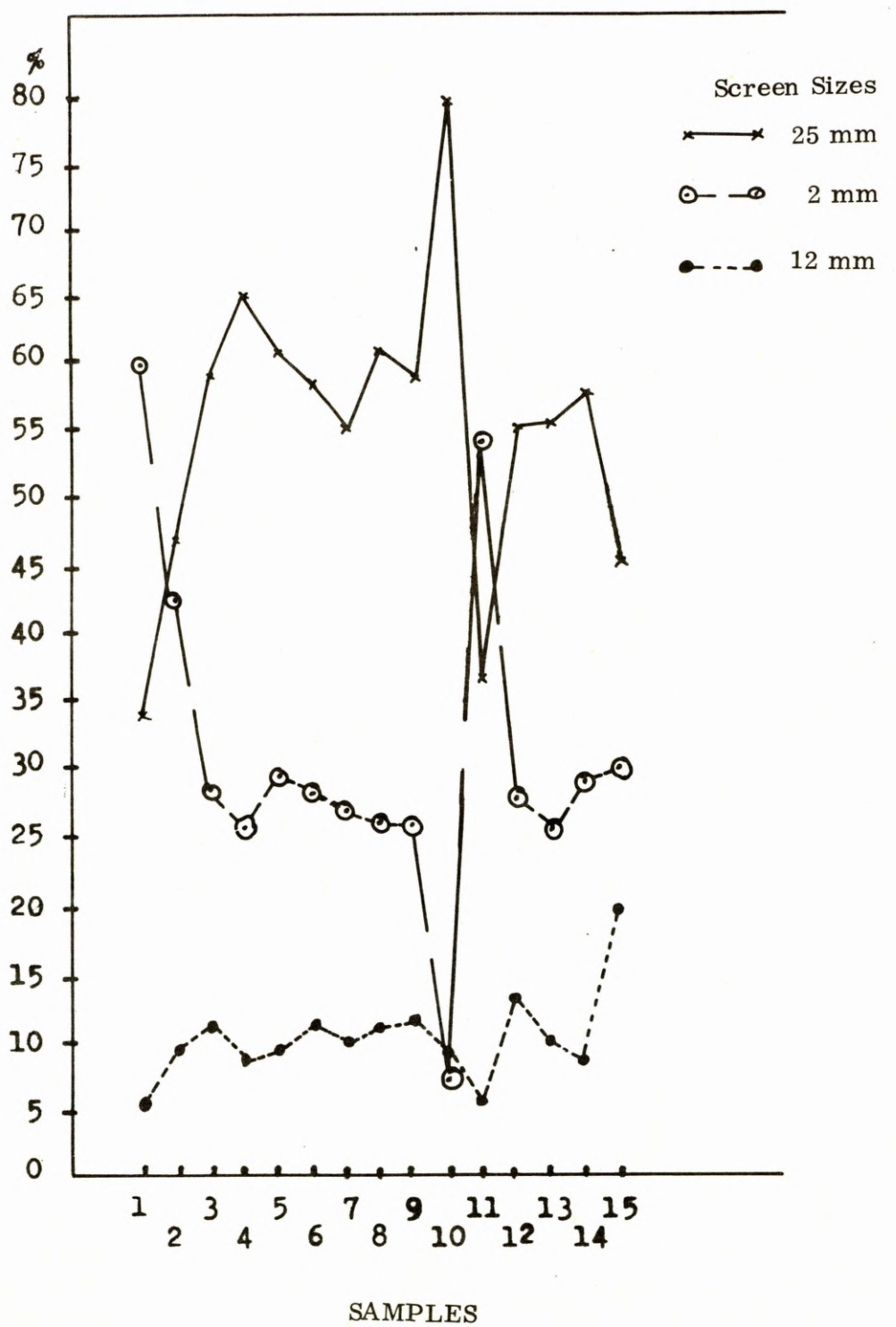



Figure VI. 3 Graph of components retained by three screen sizes on samples from Midden A

Table VI.1 presents the materials retained by the three screens used for midden A. The materials picked in the course of the excavation from the spits follow the usual practice in archaeological excavations of hand picking what was considered necessary for the sample with a view to throwing away the rest. In short, after the picking had been done the rest of the material from the spit was thrown out in buckets and then sieved. The final total results are expressed in percentages and show that 3% would have been collected by hand from the excavated portion as representing the midden content of the excavation. The materials collected from each sample area show a relationship with the amount of archaeological material present as shown by the total sieved material within the sample. On analysis of the hand-picked material it was found that bones and charcoal are very much underrepresented as these materials are smaller than the grid. In fact when the hand-picked materials were passed through the screen only 0.001% passed through the 12 mm screen. The implications of sieving in terms of data recovery in archaeological research are obvious (see Figure VI.3).

The middens in the Niger delta exhibit a fair degree of large size objects. The 25 mm screen retained 60% and the 12 mm about 9.78% and the 2 mm screen retained over 27% for midden A. The summary totals inset in each of Tables VI.17-19 show that the figures obtained for screens of 25 mm and 12 and 4 mm for middens B, C, and D come close together with 58.42%, 73.88% and 60.28% respectively for the 25 mm screen and 16.13%, 16.40% and 18.90% respectively for the 12 mm screen. So far the discrepancy seems to lie with the 25 mm screen results for midden C with 73.88%. For the screen of 4 mm the figures are 10.29% for B, 8.15% for C, and 9.91% for D. There is a high degree of agreement among them. For the 2 mm screen a discrepancy occurs widely for midden C with 1.56% while B and D have 15.15% and 10.90% respectively. This discrepancy is in part explained by the size of the components and the effect of drying. The tables show that for bone and charcoal quantification was near impossible as very sensitive scales should have been needed to give any meaningful readings. But the indication of presence or absence for these components per sample analyzed is in recognition of this problem of absolute quantification.

a) Shells

In the case of shells the use of the 2 mm screen is important especially for Gryphaea (oyster), the Tympanotonus (periwinkle) and Anadara (cockle) but decidedly crucial for the Gryphaea. The Gryphaea and Anadara fracture and fragment but more in the case of the former than the latter. In almost all cases where the 4 mm screen was used no fragmenting parts of the Anadara or even the non-fragmenting but small-size Tympanotonus were recovered in the 2 mm screen. In the case of the Gryphaea it was even observed that some parts of the shell were pulverized and lost with the residue. As the Gryphaea was noted in all sampled middens in the Niger delta, analysis must therefore include the 2mm screen as critical for the species otherwise the 4 mm screen would suffice for other species.

b) Bones

In analysis concerned with dietary values and therefore concerned with recovery of bone fragments, the choice lies between the 4 mm and 2 mm

Table VI-17 Midden B Sieving Results-Components by Screen Size (wts in gm., screen size in mm.)

| | Shell | | | | Potsherd | | | | Bone | | | | Charcoal | | | | Palm Kernel | | | | Burnt Clay | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Screen (mm) | 25 | 12 | 4 | 2 | 25 | 12 | 4 | 2 | 25 | 12 | 4 | 2 | 25 | 12 | 4 | 2 | 25 | 12 | 4 | 2 | 25 | 12 | 4 | 2 |
| Sample No. | (gm) | (gm) | (gm) | (gm) | (gm) | (gm) | | | | | | | | | | | | | | | | | | |
| 1 | 1,070 | 400 | 200 | 450 | | | 7 | | | | | | | | | | | | | | | | | |
| 2 | 1,200 | 150 | 50 | 200 | | | 4 | | | | | | | | | | | | | | | | | |
| 3 | 700 | 100 | 100 | 350 | 25 | 10 | | | | | | | | | | | | | | | | | | |
| 4 | 450 | 100 | 60 | 40 | 120 | 15 | | | | | | | | | | | | | | | | | | |
| 5 | 750 | 325 | 250 | 700 | 6 | 10 | 40 | | | | | | | | | | | | | | | | | |
| 6 | 800 | 250 | 150 | 600 | 80 | 13 | 15 | | | | | | | | | | | | | | | | | |
| 7 | 1,200 | 90 | 100 | | 120 | 20 | | | | | | | | | | | | | | | | | | |
| 8 | 200 | 80 | 100 | | 100 | 30 | | | | | | | | | | | | | | | | | | |
| 9 | 850 | 300 | 150 | | | 10 | | | | | | | | | | | | | | | | | | |
| 10 | 700 | 120 | 70 | 100 | | 60 | 70 | | | | | | | | | | | | | | | | | |
| 11 | 300 | 124 | 65 | 50 | | | | | | | | | | | | | | | | | | | | |
| 12 | 150 | 150 | 48 | 40 | | | | | | | | | | | | | | | | | | | | |
| 13 | 280 | 100 | 80 | 25 | | | 5 | | | | | | | | | | | | | | | | | |
| 14 | 320 | 250 | 150 | 200 | | 10 | | | | | | | | | | | | | | | | | | |
| 15 | 1,500 | 400 | 150 | 80 | 80 | | 2 | | | | | | | | | | | | | | | | | |
| Total | 10,400 | 2,839 | 1,783 | 2,835 | 531 | 178 | 143 | | | | | | | | | | | | | | | | | |
| % within component | 58.24 | 15.89 | 9.98 | 15.88 | 62.32 | 20.89 | 16.78 | | | | | | | | | | | | | | | | | |

Summary Totals by Screen Size

| | 25 mm | 12 mm | 4 mm | 2 mm |
|---|---|---|---|---|
| Total | | | | |
| 18,709 | 10,931 | 3,017 | 1,926 | 2,835 |
| % Total | 58.42 | 16.13 | 10.29 | 15.15 |

Table VI 18 Midden C: Sieving Results-Components by Screen Size (wts in gm., screen size in mm.)

| | Shell | | | | Potsherd | | | | Bone | | | | Charcoal | | | | Palm Kernel | | | | Burnt Clay | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Screen (mm) | 25 | 12 | 4 | 2 | 25 | 12 | 4 | 2 | 25 | 12 | 4 | 2 | 25 | 12 | 4 | 2 | 25 | 12 | 4 | 2 | 25 | 12 | 4 | 2 |
| Sample No. | (gm) | (gm) | (gm) | (gm) | (gm) | (gm) | | | | | | | | | | | | | | | | | | |
| 1 | 850 | 200 | 150 | 50 | 6 | | | | | 4 | | | | | | | | | | | | | | |
| 2 | 1,650 | 300 | 150 | 170 | | | | | | | 10 | | | | | | | | | | | | | |
| 3 | 1,600 | 450 | 200 | 160 | | | | | | | | | | | | | | | | | | | | |
| 4 | 650 | 280 | 100 | 200 | | | | | 20 | 5 | 5 | | | | | | | | | | 1 | | | |
| 5 | 1,800 | 300 | 100 | 250 | 160 | | | 4 | | | | | | | | | | | | | | | | |
| 6 | 1,370 | 150 | 80 | 100 | | | | | | | | | | | | | | | | | | | | |
| 7 | 740 | 150 | 50 | 100 | 60 | 10 | | | | | 4 | 6 | | | | | | | | | | | | |
| 8 | 500 | 150 | 50 | 50 | 270 | | 20 | | | | | 4 | | | | | | | | | | | | |
| 9 | 800 | 400 | 125 | 100 | 100 | 16 | | | | 6 | 10 | 12 | | | | | | | | | | | | |
| 10 | 500 | 200 | 152 | 50 | 220 | | | | | | 10 | 5 | | | | | | 2 | | | | | | |
| 11 | 680 | 192 | 100 | 80 | 160 | 17 | 15 | | 20 | | 2 | 4 | | | | | | 1 | | | | | | |
| 12 | 1,250 | 250 | 52 | 100 | 80 | 7 | 3 | | | | | 3 | | | | | | | | | | | | |
| 13 | 1,300 | 100 | 100 | 250 | | | 6 | | | | | | | | | | | | | | | | | |
| 14 | 1,000 | 270 | 100 | 200 | | | 4 | | | | 3 | | | | | | | | | | | | | |
| 15 | 578 | 150 | 75 | 300 | | 15 | 20 | | | | | 20 | | | | | | | | | | | | |
| Total | 15,218 | 3,542 | 1,684 | 1,750 | 1,056 | 65 | 72 | | 40 | 15 | 44 | 44 | | | | | | 3 | | | 1 | | | |
| % within component | 68.5 | 15.9 | 7.6 | 7.9 | 88.3 | 5.5 | 6.2 | | 28 | 10 | 31 | 31 | | | | | | | | | | | | |

Summary Totals by Screen Size

| | 25 mm | 12 mm | 4 mm | 2 mm |
|---|---|---|---|---|
| Total | | | | |
| 22,080 | 16,314 | 3,622 | 1,850 | 344 |
| % Total | 73.88 | 16.40 | 8.15 | 1.56 |

screens but it must be emphasized that observations in the field tended to show that the 2 mm screen was really necessary. Even beyond this, other techniques should be employed.

c) Charcoal

Although charcoal was removed from the excavation for radiocarbon dating the bulk of the charcoal recovered was from the 2 mm screen. But as these samples were removed in arbitrary levels their total weights have been assigned to the 12 mm screen for midden A when they would have been recovered by the 2 mm screen. Even then much material still escaped through mesh of the screens, being either pulverized or still adhering to wet soil matrix. This situation is also true for bone fragments and it became necessary to wet-sieve the residue held by the 2 mm screen for maximum recovery of fragments.

d) Pottery

The pottery component showed a marked consistency in the amount recovered with the 12 mm screen as a standard minimum size. Field experience showed that while the potsherds passing through the 12 mm screen were useful for establishing total midden mass or total component weight in the midden, they defied analysis, being worn, fragile and too small to show features for study except for fabric.

8. Washing Damp Shell Midden Components

In dealing with middens having an appreciable earth matrix it was found desirable to wash the sample if one is combining excavations with the screening in the field. This may not be necessary for samples dried for laboratory analysis. Washing is likely to lead to further fragmentation for bones and shells and if not cautiously undertaken may lose information. Where unskilled labour is employed for washing much supervision of the operation is necessary. In these experiments all the sea shore shell middens were sampled on the spot by using between three to five samples not more than 1000 gms in maximum weight. The purpose of this was to obtain details of the midden composition across the delta rather than special analysis of the nature of the middens A, B, C and D. The results do not offer any new information and therefore are not for reproduction although they are available and showed a general similarity across the delta.

In summary therefore it can be confirmed that the choice of screen in midden analysis depends largely on the research objectives and where the samples would be processed. In the course of the fieldwork on which the present study is based materials taken from a 3.15 metre deep excavation in midden A unit stripped in 15 centimetre spits in a 2 x 2 m cut, were collected, screened and processed in the field, 52 other samples from three other middens were processed in the laboratory following traditional midden analysis in America (Cook and Treganza 1947, Greenwood 1961) and New Zealand (Davidson 1964). Comparing the results obtained and the problems involved it appears necessary to process a number of samples, at least five, before deciding on what samples to take for laboratory processing. A critical screen size for maximum result lies between the 4 mm and 2 mm screens for fairly loose dry samples but 12 mm would be helpful to reduce the problem of having to beat wet matrix over a long time. Beyond screening, flotation is considered

Table VI.19 Midden D Sieving Results-Components by Screen Size (wts in gm, screen size in mm)

| | Shell | | | | Potsherd | | | | Bone | | | | Charcoal | | | | Palm Kernel | | | | Burnt Clay | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Screen size | 25 | 12 | 4 | 2 | 25 | 12 | 4 | 2 | 25 | 12 | 4 | 2 | 25 | 12 | 4 | 2 | 25 | 12 | 4 | 2 | 25 | 12 | 4 | 2 |
| Sample No. | (gm) ⟶ | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 490 | 200 | 250 | 100 | | 56 | 10 | | | | | | | | | | | | | | | | | |
| 2 | 1,000 | 300 | 2,000 | 200 | 27 | 60 | 25 | | | 1 | | | | | | | | | | | | | | |
| 3 | 1,000 | 350 | 150 | 150 | 200 | 8 | | | | | | | | | | | | | | | | | | |
| 4 | 770 | 200 | 100 | 130 | 100 | 45 | 15 | | | 10 | 20 | 15 | | | | | | | | | | | | |
| 5 | 200 | 206 | 48 | 100 | | | | | | | | | | | | | | | | | | | | |
| 6 | 800 | 270 | 100 | 100 | 140 | 60 | | | | | | | | | | | | | | | | | | |
| 7 | 500 | 250 | 150 | 250 | 300 | 25 | | | | | | | | | | | | | | | | | | |
| 8 | 500 | 150 | 100 | 200 | 160 | 15 | 15 | | | | | | | | | | | | | | | | | |
| 9 | 850 | 250 | 100 | 100 | 450 | 35 | 7 | | | | | | | | | | | | | | | | | |
| 10 | 1,280 | 300 | 120 | 200 | | 6 | | | | | | | | | | | | | 2 | | | | | |
| 11 | 600 | 250 | 240 | 360 | 80 | | | | | | | | | | | | | | | | | | | |
| 12 | 400 | 100 | 100 | 150 | 120 | 20 | | | | | | | | | | | | | | | | | | |
| 13 | 800 | 200 | 120 | | 40 | 50 | 20 | | | | | | | | | | | | | | | | | |
| 14 | 600 | 100 | 110 | 300 | | 30 | | | | | | | | | | | | | | | | | | |
| 15 | 700 | 180 | | 300 | 35 | 60 | 6 | | | 8 | | | | | | | | | 6 | | | | | |
| 16 | 100 | 450 | 200 | | 100 | 20 | 300 | | | | | | | | | | | | | | | | | |
| 17 | 750 | 200 | 100 | 200 | | | | | | | | | | | | | | | | | | | | |
| 18 | 1,000 | 507 | 200 | 100 | | 10 | 4 | | | | 1 | 1 | | | | | | | | | | | | |
| 19 | 980 | 390 | 100 | 100 | 20 | 35 | 6 | | | | | | | | | | | | 4 | | | | | |
| 20 | 500 | 150 | 100 | 100 | 570 | 7 | | | | 1 | | | | | | | | | 1 | | | | | |
| 21 | 1,200 | 150 | 80 | 150 | | | | | | 1 | | | | | | | | | | | | | | |
| 22 | 760 | 80 | 40 | 60 | 200 | 40 | | | 1 | | | | | | | | | | | | | | | |
| Total | 15,780 | 5,733 | 2,638 | 3,350 | 2,742 | 574 | 408 | | | | | | | | | | | | | | | | | |
| % within component | 58.44 | 19.38 | 9.77 | 12.41 | 73.63 | 15.41 | 10.96 | | | | | | | | | | | | | | | | | |

Summary Totals by Screen Size

| | 25 mm | 12 mm | 4 mm | 2 mm |
|---|---|---|---|---|
| Total 30,725 | 18,522 | 5,807 | 3,046 | 3,350 |
| %Total | 60.28 | 18.90 | 9.91 | 10.90 |

obligatory for adequate qualitative if not quantitative observations whether the materials are processed in the field or in the laboratory.

9. Other Approaches to the Study of Shell Middens

Beyond the techniques of shell midden study discussed above attention should also be directed to other methods which have shellfish as their material for study. Some of these have been directed to mollusca as part of an ecosystem. Interest in this direction concerns age and population density of the species, the effect of varying environmental conditions upon their lives and characteristics (Orton 1923) and the growth rings as tools for their age estimation.

The application of these methods to archaeological interpretation is still in the experimental stage as work in New Zealand has shown (Coutts 1970; Coutts and Higham 1971; Swalding 1972). Work on the oxygen isotope present in the calcium carbonate of shells and the analysis of the palaeo-temperature of the sea in which the mollusca lived has been undertaken by Shackleton (1969, 1973).

Shell banding has also been studied (House and Farrow 1968; Koike 1973). These studies are based on the seasonal variations in temperatures which are reflected in the shells of the mollusca. This branch of study is unlikely to be applicable to the tropics where marked thermal variations are not as pronounced as in the temperate latitudes.

# CHAPTER VII

# PATTERNS OF SUBSISTENCE ECONOMY IN THE DELTA

## INTRODUCTION

According to Clarke (1968: 115) the economic subsystem of a people's culture comprises a set of information about resources in a particular territory and the strategy for their exploitation. The strategy of resource exploitation involves complex decisions on the importance attached to each resource, the amount of time and energy to be invested on it and consequently the amount produced, and the general pattern of its distribution. The two categories of strategy within the economic subsystem which help understand the patterns of the subsistence economy are: 1) the strategy of site location and 2) the strategy of subsistence organization.

In Chapter III we discussed the concept of territories, sites and site locations and in Chapter IV we used field data to show the distribution of resources and to identify the general constraints in, and patterns of, settlement location. In Chapter III the thesis had been advanced that the value of a food resource must to a large measure reflect its contribution to the total energy requirements of the individuals that invest in it.

By the experimental midden excavations (Chapter V) we established that the settlements exploited a number of animal, fish and shellfish resources and by the subsequent shell midden analysis (Chapter VI) we showed that a quantitative approach to the analysis of archaeological food residues could help to give more information on the contribution of the various food components within a site to the diet of past people. However the result of the dietary analysis (Chapter VI) showed that although shell middens in the Niger delta contain quite a large amount of shells which therefore represent a reasonable amount of shellfood, shellfish does not appear to have been a major staple.

The archaeological evidence from eastern Niger delta could convey the impression that the economy was based only on the procurement of shellfish, fish and wild animals. Normal excavation techniques emphasize the meat yielding resources to the total neglect of the vegetable resources thereby creating an error. The imbalance arises as a result of the nature of the vegetable resources, preservation problems and perhaps the archaeologist's bias which dictates his choice of excavation strategy and the data recovery techniques at his disposal. But because energy relationships alone cannot provide a complete explanation of an economy as other factors such as cultural and food habits affect human decisions about food, alternative explanations must also be sought.

The present chapter seeks to achieve two things: 1) to survey the patterns and organization of subsistence activities within and around the Niger delta and 2) to use a territorial model (Site Catchment Analysis) to study the strategy

of resource integration (on-site and off-site data) and therefore to more fully assess the components of subsistence activity and resolve the discrepancy between the archaeological and modern ethnographical data.

1. Components of Subsistence Economy

Two possible models may help analyse the subsistence economies: 1) the subsistence 'activity' model which identifies economic activities in terms of their organization. This is in line with traditional ethnographic studies which see economic activities in terms of gathering, hunting, fishing, animal husbandry and agriculture. (2) the subsistence 'material' model which uses biological criteria by identifying subsistence economies with the plants and animals utilized. It is difficult to draw a clear distinction between these two models but because the 'subsistence' materials model has been isolated in Chapter IV, more concern will be devoted here to the 'activities' model.

Murdock (1967: 154-155) in his Ethnographic Atlas recognized five types of subsistence economic activities—1) gathering of wild plants and small fauna, 2) hunting which includes trapping and fowling, 3) fishing which includes shellfish and the pursuit of aquatic animals, 4) animal husbandry, and 5) agriculture. Lee (1968: 41) rightly proposed that the pursuit of aquatic animals be included within the domain of hunting, while the collection of shellfish be seen as part of the gathering activity. Although Beals (1964: 136) regards this quasi-compartmentalization of subsistence activity as a set of artifical categories instead of primarily a matter of time, labour, and food gathering, categorization of subsistence activity is more or less a heuristic device and like all classifications gains its strength from the order it bestows on the analysis of data. In the following sections four subsistence activities—collecting, hunting/trapping, fishing and cultivating are studied. They are related to the territory, resources and technology as interrelated factors of an economy. Although a development may have been possible from one sector of the economy to another, no evolutionary processes are necessarily implied for, as observed in the field, these four levels of subsistence economic organization still exist in the delta side by side though varying in importance. Because animal husbandry is not today an essential component of the subsistence economic activity of the area under study and there is no reason to suggest that it was in the past our model of food production is in terms of cultivation. However, these categories of the economy are discussed in generalized form over the entire eastern Niger delta especially in zones where similar practices obtain but mention being made of specific differences from one ecological zone to another or where only one zone is involved with a particular activity.

a) Collecting

(i) Insects

The collecting of insects is a more widespread activity in the mainland and parts of the freshwater than in the mangrove swamp zone. In the period between December and March grasshoppers are collected from cultivated land; this activity is combined with yam harvesting. Nowadays these insects live on cassava leaves. Beyond that a number of other kinds of grasshoppers are also collected in the forest. This is done by groups of women or children. The men also collect honey from wild bees in tree trunks in forests. Honey is highly regarded all over the Niger delta, and indeed Nigeria, and it is often

on sale in the market today. No attempt is made to control it as the groups living in the northern part of eastern Nigeria do with calabashes and earthen pots set high up on tall trees. The men also search dead trees especially the palm wine tree Raphia hookeri for the larvae of Rhinoceros beetle R. oryctes, which are collected, and eaten fresh or roasted. During fieldstudy in Nembe in March 1977, these larvae were observed on sale. Although they are valued by the collectors, insects are negligible in total weight of food taken by the individual and in nutritional value. No remains have yet been found in excavated contexts.

(ii) Molluscs

The archaeological evidence (see Chapter VI) for the gathering of shellfish comes from the abundant Niger delta shell middens. These shell middens are the dominant archaeological manifestations in the fresh and saltwater delta (refer to Chapters IV - VI).

The occurrence of the different species within these zones has already been discussed (Chapter IV). A characteristic common to all the surveyed midden sites is that they contain substantial quantites of material culture elements (Chapters VIII and IX) so that the middens can safely be assumed to be the result of mixed domestic activities (Meighan 1969). It can therefore be said with a high degree of certainty that the Niger delta shell middens were the result of settled life not of a casual seasonal mobile activity. (See Transhumance and Seasonality).

(iii) Wild Plants

Collecting of wild plant foods may be divided into two: picking and digging up. While picking may require reaching the fruit or grain with the hands, climbing to it or simply picking it from the ground, digging of tubers and roots requires some digging tool especially where the tuber is buried deep down in the ground. Thus while the palm wine fruit, oil palm fruit, the aerial wild yam and the African breadfruit were picked together with other fruits not now eaten; the tubers tololo and yams (Dioscoreacaea) were dug up.

The archaeological evidence does not yet give any indication that wild plant resources were collected. Evidence from ethnographic surveys stresses the importance of wild plant resources in the diet of the gathering communities. It is difficult to assess the relative importance of wild plant foods in the Delta.

Mgbusu, the fruit of the palm wine tree, Raphia hookeri, appears to have been used as a food over the entire delta (Williamson 1970: 157). This tree which is only protected in the delta but is cultivated in mainland eastern Nigeria is also the source of building and fishing materials, fishing traps, sleeping mats, storage baskets are woven from the fibre, the midribs are used for building houses; the sap is the famous palm wine and can be distilled. It was observed in the course of the fieldwork that mgbusu and the larvae of the Rhinoceros beetle are still sold in the market.

The oil palm fruit, ene megboli, is collected from the wild palm tree, Elaeis guineensis. Palm nuts have been recovered in excavations at Okochiri, Ke, Saikiripogu and Onyoma. Although not precisely dated they appear to have been in widespread use in the delta before the 9th century B.P. The Ke regard

the palm fruit as the first fruit known to man and throughout eastern Nigeria the oil is used in every meal, the nut being valued as a hunger breaker.

Lu, a type of African breadfruit, is said to have long been exploited. Today it is prepared like beans and is highly valued.

Tololo, a highly toxic tuberous crop like cassava (manioc) was collected. To make it edible it was peeled and soaked for over twelve hours followed by much washing. Served in palm oil with fish and palm nut, tololo appears to have been a main source of carbohydrate for mangrove delta groups. The Ke contend that tololo so satisfied their needs that they had no need for other carbohydrates. Because the forest territory was limited and because the crop was at best protected and never cultivated, its regenerative potential could not keep pace with the increasing demand of a growing population. It was perhaps at this point in time that dependence on the hinterland cultivators for the supply of carbohydrate foods became inevitable.

Yams (Dioscoreacea) were dug up in the wild in the delta (Williamson 1970). In Ke, a type of aerial wild yam, so, similar to the hinterland adu, Dioscorea bulbifera, was picked in the forest. It is still on sale in mainland markets close to the delta where it is still collected.

No statistics are available on the extent to which gathered wild food resources were utilized nor their relative importance in the subsistence economies nor even of the size of the population that depended upon them or the resource potential of the forests. It does appear that although some of the carbohydrate food resources such as tololo, buru, and so may have satisfied demand in certain areas for certain periods, they were normally supplemented by resources from other exploitation strategies.

b) Hunting and Trapping

A hunting economy is construed here to mean the dependence of a human group for its subsistence on one or more animal species. Viewed in this way and supported by the evidence from the archaeological, ethnographic and oral sources (Nzewunwa 1976), the conclusion is that the delta did not possess a pure hunting economy. Animals were exploited on a casual basis and no particular animal species seem to have been the mainstay of any groups.

Rosevear's (1953) atlas of wild life in southern Nigeria is the only comprehensive attempt to document animal life in the area but it does not indicate the carrying capacity of the ecological zones nor the population density of the animals catalogued. The distribution of animals has been presented in Chapter IV. The recorded and observed man-wild animal relationship in the area takes the form of hunting and trapping. A likely explanation for the absence of specific hunting economy may have been the scarcity of large game but possibly important was the absence of a developed technology for hunting.

(i) Hunting Methods

The delta and the neighbouring mainland have no known lithic tradition. The report from Aba of a single stone tool from the surface (Anozie 1977) hardly contradicts this, although archaeological sampling is still too limited to permit generalizations. From ethnographic studies clubs, bows, arrows, spears and traps are known, but these are of organic materials—wood, leather and gut—they are not usually preserved in archaeological contexts.

The hunting tools unless made lethal with poison would be ineffective against the larger game although the wooden spear and club can be effective at short range. Trapping methods were more diversified and appear to have been more effective than hunting for both large and small game. Traps of disguised and stockaded trenches, tree trunk booby-traps, fence and bait traps, rope-loop traps were used for both large and small animals. Although metal tools did affect the man-animal relationship when they were introduced they were simply adapted and added to the traditional wooden gear and in no case did they displace them. The introduction of factory and locally made guns in the 16th century must have made a great impact on the animal population. Although this is hard to assess, Basden (1921) blames the depletion of game in eastern Nigeria upon the introduction of the gun. If we preface this line of reasoning with the fact that eastern Nigeria is a place without abundant game resources (NEDECO 1959: 222) the depletion and extinction of some species can be easily understood.

Hunting is a man's activity which may be undertaken day or night by an individual or group of specialized hunters from far and near or indeed by different age groups. Today the dog is widely used and specimens have come from archaeological contexts at Ogoloma.

The evidence from Okochiri and Ogoloma excavations is conclusive that there existed hunting/trapping economies in these pre-9th and 13th century settlements, respectively. The bones from the Okochiri excavations are of small animals which could have been taken with traps, bows and arrows or spears.

The site of Ogoloma provides an impressive list of animals utilized from about the 13th century A.D. (see Table VII.1). Although animal bones were recovered from all the excavations carried out only these two sites have so far been studied. The distribution of animal bones within sites is presented in Table V.I.

The Ogoloma site shows a fully developed hunting/trapping activity. The list of large game suggests not the use of simple technology but of firearms imported or manufactured locally. The site development shows full involvement in the Atlantic trade suggesting that a sophisticated hunting/trapping tool kit was to a large extent of imported materials from the 16th century.

The Ogoloma site contains some quantity of large aquatic mammal bones, e.g. Trichechus, (Manatee), and Hippopotamus Amphibius. This element was absent from the Okochiri middens. When one considers also that the Ogoloma excavation did not employ sophisticated data recovery techniques such as floating and sieving it can be appreciated that the recovered bones are but a fraction of the total. There is a loss, therefore, of small bones. Although domestic animals, Capra hircus (goat), Bos bovis (cow), Canis familiaris (dog), Felis calis (cat) are represented in the Ogoloma materials the bulk are of wild animals, Loxodonta africanus (elephant), Neotragus pygamus (royal antelope), Panthera pardus (leopard) and the evidence seems convincing that Ogoloma represents the last and perhaps best developed stage of a hunting/trapping strategy. But hunters today using flintlock guns and traps bring home game from time to time. The sharing follows kinship and age-grade lines in the form of gifts although surplus is sold. Oral sources (Alagoa 1972) relate many problems engendered by the search for meat from hunting.

Table VII·1 Animals Identified from the Site of Ogoloma

| Exc. Pit | Level | Bone Wt. (g) | Capra hircus (Goat) | Bos bovis (Cow) | Neotragus pygamus (Royal antelope) | Pantera pardus (Leopard) | Canis familiaris (dog) | Loxodonta africans cyclotis (Elephant) | Felis catus (Cat) | Kobus defassa (Water buck) | Trichechus senegalensis (Manatee) | Hippopotamus amphibius (Hippopotamus) | Lophins piscatoris (Angler fish) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| IA | 1-3 | 390 | 1 | 1 | | | | | | | | | 1 |
| | 5-6 | 490 | 1 | 1 | 1 | | | | | | | | |
| | 10 | 110 | 1 | | | | | | | | | | |
| | 12 | 460 | 1 | | | | | | | | 1 | | |
| | 13-14 | 330 | | | | | | | | | | 1 | |
| | 15-16 | 650 | 1 | | | | | | | | | 1 | |
| | 17-18 | 220 | | | | | | | | | 1 | | |
| | 20-21 | 80 | 1 | | | | | | | | | | |
| | 23-24 | 1630 | | | 1 | 1 | | | | | | | |
| IB | 5-6 | 540 | | | | 1 | | | | | | | |
| | 7-8 | 420 | | | | | | 1 | | | | | |
| IC | 1-2 | 70 | 1 | | | | | | | | | | 1 |
| | 5-6 | 330 | 1+ | | | | 1+ | | | | | | |
| | 7-8 | 1080 | 1 | | | 1 | 1 | 1 | | | | | 1 |
| | 13-14 | 320 | 1+ | 1+ | | | | | | | | | |
| | 15-16 | 310 | 1+ | | | | | | | | | | |
| | 17 | 240 | 1 | | | | 2 | | | | | | |
| ID | 1-2 | 320 | | | | | | 1 | | | | | |
| | 3 | 70 | | | | | | | 1 | | | | |
| | 4-5 | 240 | | | | | 1 | | | | | | |
| | 6 | 400 | | | | | | | | 1 | 1 | | |
| | 10 | 120 | 1 | | | | | | | | | | |
| Total | | 8820 | 12+ | 3+ | 2 | 2 | 5+ | 3 | 1 | 1 | 3 | 2 | 3 |

(Data from identification reports of Dr. M. Iwuala, Dept. of Zoology, University of Nigeria, Nsukka)

The butchering techniques help to distort the archaeological situation for the skulls of major kills were deposited at the shrine or altar of the god to which success in the hunting/trapping activity is credited. For instance, over fifteen skulls of animals that ranged from the manatee through the antelope to the diuker were deposited at the altar of the hunters' cult in Ke village by 1977.

However no single species is consistently abundant at all levels at Okochiri. The conclusion is that hunting/trapping were relatively unimportant activities. Lee (1968) has remarked, "hunting is a high-risk low-return subsistence activity" and compared with "gathering...a low-risk high return subsistence activity...the hunting of animals is the least reliable source of food, and should be generally less important than either gathering or fishing" (Lee 1968: 40-41).

c) Fishing

Fish have been an important traditional Nigerian food. According to FAO statistics for 1974 (VCOAD 1975), Nigeria is the world's 6th largest consumer of fish and shellfish with a per capita intake of just over 5 kg. edible weight per annum. Of the total marine landings in Nigeria, over 87% is caught by canoe fishing along the coast (Borgstrom and Paris 1975). A great many people of eastern Nigeria who live near or along river banks or the sea coast spend a good part of their lives fishing (Unigwe 1939). In the Niger delta practically everyone engages in one or more types of fishing, part-time or full-time. Usually this activity is on individual basis and the catch is primarily for domestic consumption. Coastal Niger delta social history is said by some to have evolved from an economic base dominated by fishing (Horton 1969).

(i) Organization and Fishing Methods

Traditionally fishing operations take place in daylight, especially in the dry season, but some degree of night-fishing especially for commercial purposes is undertaken today. The bulk of fishing activities takes place in the delta where the varied ecological situations offer shallow-creek, estuarine, in-shore and off-shore fishing. Except where exchange is the main motivation, there is very little organization and collaboration in fishing, except in the freshwater zone (see below).

The fishing methods are rudimentary and the technology relies on home-made gear including wooden spears, traps of different types and sizes; only bone and wooden hooks were used before the coming of the Europeans. Each set of equipment is adapted to very special environments for optimum returns, thus the fence is used in many tidal creeks and rivers while the basket traps are used in slow moving tidal waters. Canoes are found everywhere.

Nets woven from cane are employed largely in the river Niger and its tributaries within the freshwater and saltwater zones. These are either worked from canoes or by wading. The second, also referred to as the seine, is worked from sand banks with the aid of canoes which take out the nets and sink them after which the nets are hauled ashore. Working nets from canoes requires quiet waters out of the direct, strong currents and not less than two men to balance the canoe while throwing the net. Hook and line fishing is also undertaken, especially in the clearer waters of freshwater rivers. Basden (1921) remarked that there were native hooks but he judged them too crude to catch

any fish except the most guileless of them. It is possible that these hooks were of metal. Apart from line fishing by day, night lines are also set for fish.

The women weave large ground nets of cotton yarn (Basden 1921: 139) or cane with which they filter shrimps and prawns. At times these are set like traps at the bank of streams. In shallow tidal and fresh waters they use poison to catch fish. In the mainland zone, fish poison made of "the flowers and leaves of the iwelli plant" (Basden 1921: 141) is used while in the mangrove swamps Raphia vinifera (de Cardi 1899, Williamson 1970) is used. The use of fish poison is widespread throughout West Africa (Hornell 1950).

During the wet season a large part of the freshwater delta is flooded and this gives the fish a chance to find new food materials and also grow fat. As the water recedes with the advance of the dry season a number of pools and pans of water are created. In some cases the natives take care to build barricades to ensure that the fish are landlocked in these pools and other parts of the stream which they reckon would supply quite a large fish yield. In due course they organize fish drives in which they catch the fish either for domestic consumption or export to the neighbours.

These methods were effective for fishing in shallow waters. Perhaps it was not until the European nets, cast nets and drift nets of different meshes were introduced after the 15th century that deep water fishing became a lucrative venture. These nets although precision-made required more than one man to handle and with the right kind of canoes opened the route for long distance offshore fishing. It was rewarding by the quality and quantity of the catch but hazardous in the risk of strong waves and currents and definitely led to the loss of many lives.

Niger delta fishing is not mechanized and fishing still follows traditional lines. But there is a feeling among local fishermen interviewed that extensive exploitation over the years by boats with outboard engines is taking too great a toll of the fish although official circles give the impression that the gear is too rudimentary to attain maximum results (NEDECO: 1959). The situation, in fact, is one in which the local fishermen visit the same fishing grounds from year to year and very few go beyond these grounds. The possibility therefore is that the regenerative power of the fish population is perhaps unable to cope with the level of its exploitation. It is perhaps in this light that one can appreciate that "because of the intensive exploitation of the fishing grounds in creeks and lagoons over the years, total production is low, averaging only about three lbs. per man per day" (Floyd 1969: 243).

(ii) Direct Archaeological Evidence

Direct archaeological evidence for fishing comes from the excavations in which hundreds of fish bones were found. Unfortunately most of the fish species are still unidentified because comparative collections do not exist so they have not yet been studied. It is only convenient therefore to present what is known at the moment by way of absence or presence of fish bones from stratigraphic layers (see Table V.I). This is in no way a true indication of the complete picture because in such middens where dry- and wet-sieving were not used as a standard technique only large fish bones had been picked. Judged from the results from the Okochiri shell middens and the series of column samples

that were dry- and wet-sieved, it can be seen that fish bones are widely represented in all the stratigraphic layers of the Okochiri middens. We expect that a similar situation obtained in the other midden sites excavated before 1976 if we also use the results from the limited column samples which were collected, sieved and sorted on the spot in the course of cross-check field survey conducted in 1977.

d) Plant Cultivation

Problems in the study of the past of tropical African cultivated crops stem from the lack of direct archaeological evidence. These problems have been set out in a recent collection of papers on the state of knowledge and ignorance on the subject (Harlan, de Wet and Stemler 1976). The papers illustrate the variety of crops planted, the variety of ecological situations, the variety of cultivation systems and come to the conclusion that African "domestication", "a process, not an event" (Harlan et al. 1976: 6) has unique characteristics. The nature of the crops involved in this process in the tropical forest parts of Africa renders it unlikely that direct evidence will be available (Shaw 1976: 117). The reconstruction attempted here places emphasis on the use of field observations, territorial analysis (Higgs 1975, 1976) ethnographical, botanic and linguistic evidence (Coursey 1967, 1976, Coursey and Coursey 1971, Seddon 1968, Alexander and Coursey 1969, Williamson 1970). The aims of the study will be; 1) to identify the cultivated crops that are important in the present eastern Niger delta subsistence economy, 2) to examine their distribution and find out how long the crops have been there and 3) to examine their contribution to the economic subsistence and relate this to the interrelations between the delta folk and their neighbours.

Although three ecological zones are recognized as being influential over human, animal and plant life and to a large extent also determine what crops are planted within the delta, there has been some migration of crops between the zones as a result of movement of people and ideas and the breakdown of cultural barriers instead of changing ecological conditions. As a result the crops will not necessarily be discussed with an ecological model but as independent items, efforts being made to identify them with their 'natural' habitats and possible migrations.

The cultivated crops that are important in the subsistence economy are: yams, cocoyams, cassava, plantains/bananas and maize. Although fruits, spices and vegetables are planted, their contribution to the overall diet in energy terms is very limited, they are therefore omitted in this survey.

(i) Yams

Of the 600 wild species (Purseglove 1972) of yam (Dioscorea sp.) scattered over the tropical and sub-tropical world only a few have ever been closely associated with man. Botanic and ethnographic knowledge of the yam (de Candole 1886, Watt 1890, Chevalier 1936, Burkill 1938, 1939, 1960, Miege 1952, 1954, Waitt 1963, Coursey 1965, 1967, 1976) has advanced considerably but we are still ignorant of the yam in the archaeological context. These botanists and ethnographers have, however, long noted the availability and use of wild yams by hunter-collectors in the African rainforests, as famine foods among farmers (Burkill 1939, Dalziel 1937, Irvine 1949) even in Nigeria (Okiy 1960).

Of the few wild species of economic importance to collectors there has been confusion in their identification, even among West African main species there is confusion in their taxonomy (Coursey 1976, footnote p.391). Uchendu (1965) notes that the Igbo distinguish more than fifteen varieties usually ranked according to their function in the 'yam title' (see also Thomas 1913). But government sources note that the 'varieties' known to the local people do not seem in most cases to fall into clear cut vegetative character-groups (Agriculture Department Report 1957/58). Although only adu, Dioscorea bulbifera and D. dumetorum Una, are known wild African species, Chevalier (1946) has also claimed wild forms of D. cayenensis in West Africa. In the area under study the major cultivated economic species are D. rotundata Poir Guinea white yam and D. cayenensis Lam., Guinea yellow yam.

The antiquity of yam cultivation has not been established by any chronometric technique but recent speculation puts this process as beginning in the immediate post-5000 BP (Coursey 1976), without the use of iron, (based on cultural evidence of the prohibition of iron tools in digging yams), and the elaborate and widespread New Yam festivals (Coursey and Coursey 1971). Furthermore on the basis of evidence that stone tools and indeed fire (Gray 1962) may have played a crucial role in forest clearing it is no longer necessary to connect the exploitation of the forest region for yam cultivation with the knowledge of iron. There is no doubt however that iron must have been highly valued once it was introduced but the point is that it was not a prerequisite for the occupation of and cultivation in the forest zone. This point is important because of the fact that the yam is a forest-savanna edge crop, although in a recent survey by Anozie and the present author in Nsukka, a number of wild yams were recovered from the forest margins running along the river banks. These wild yams are now being cultured in an experimental farm established by the Archaeology Laboratory staff of the University of Nigeria, Nsukka. However yams are not known in the mangrove forests of the Niger delta which are salty and generally under tidal floods-conditions which the plant does not tolerate. Its cultivation is restricted to the mainland coastal plains where the cultivation follows the pattern in other parts of West Africa. In the freshwater zone they are adapted to suit the season. In short, they are planted as early as December and harvested before the June/July floods while in the mainland they are planted about March and harvested about November and December, although for some species a first harvest takes place around August. Before the coming of the Asian and American plants, yams must have been the only planted crop.

(ii) Cocoyam

From the first few centuries A.D. onwards, the cocoyams may have ranked next in importance to the yam in the subsistence economy crop list of the eastern delta. They were the staple in the lean months between the planting of the yams and the first yam harvests. Unlike the yam they were in the hands of the women and must have held socio-religious and economic status among the women (Uchendu 1965). Two major types of cocoyam are known in the area: the Colocasia species (C. esculentum and C. antiquorum) and the Xanthosoma species (X. sagittifolium). There is considerable confusion in the nomenclature of the cocoyams.

It had been thought that Colocasia species was indigenous to West Africa (Dalziel 1955: 481, Allan 1967: 226, Johnston, 1958). They have however been traced to South-east Asia (Burkill 1938). The variety esculenta (taro or dasheen) with pellate leaves and a single large corm is said to have spread to India and reached the eastern Mediterranean in classical times from where it spread across Africa through Egypt (Burkill 1938) to the Guinea coast (Purseglove 1975) at the beginning of the Christian era (Harris 1976). However, the Colocasia holds a dominant position in the eastern Niger delta (Irvine 1953). In Awgu and Okigwe areas of mainland and among the Kolokuma of the freshwater delta elaborate festivals follow its harvest, suggesting its antiquity.

On the other hand, the X. sagittifolium (tania) has sagittate leaves and is said to be recently introduced from South America to West Africa in the late colonial era, although Johnson (1958) believes they were in West Africa by the 16th century. In Nigieria the Xanthosoma is highly restricted to the coastal areas and has not made much impact on the inland cultivators. Linguistically the Colocasia does not show any sign of being introduced from Asia as its root ede has been traced only to Igboland (Williamson 1970) from which Taro at least must have spread to the freshwater zone and the mangrove swamps. The other cocoyams (Xanthosoma sagittifolium) has appelations of ede beke (European ) or the name ede Aro (Aro cocoyam) showing that the Aro introduced it perhaps in the course of their slave dealing activities from the 16th century. Perhaps the older Colocasia may have suffered what Shaw (1976: 129) refers to as replacement by new species but evidence from eastern Nigeria does not support the replacement theory much more the Southeast Asian diffusion hypothesis.

(iii) Cassava/Manioc

Cassava (Manihot sp.) is an exotic crop plant from America. It has established itself in the food crop economy of eastern Nigeria (Johnston 1958). It appears to have been introduced into Nigeria by the second half of the 16th century A.D. (Jones 1959) although Barbot (1732: 378, 399, 405) had observed it in Warri. It is not known whether it was from Warri that the two species, M. esculenta, bitter cassava (the most widely grown and eaten), and M. palmata the sweet cassava, spread all through Nigeria. However, it is noted that the M. palmata is restricted to the coast. M. esculenta the source of 'garri' appears to have become more acceptable with the introduction of a method of processing it into cassava meal (garri) with the arrival of freed slaves from Brazil in Lagos from the 1780s (Agboola 1967). M. esculenta although tolerant of most soils and reduced rainfall regimes, does not flourish in the mangrove swamps, where today it can be found only in dwarfed conditions growing on some isolated gardens.

(iv) Plantain and Bananas

Plantain and bananas (Musa cultivars spp.) are cultivated on some scale throughout south eastern Nigeria but form a very important part of the diet of the people only in the delta (Nigeria Dept. of Statistics 1950-51). It is only in the Cameroons that plantains constitute the staple diet (Galletti et al. 1956).

These Musa cultivars are of Malaysian origin, from where they were brought perhaps through Malagasy Republic into Africa by the first millennium A.D. Simmonds (1962) considers that they spread to the east coast and into the heart of Africa by way of the Zambezi Valley and the great lakes, across the Congo basin to W. Africa where they were established before the arrival of the first Portuguese explorers in the 15th century A.D.

The implications of accepting this diffusion route must be stressed for other cultural items found in West and East Africa. Although the exact route cannot be reconstructed it must be considered along other interpretations. Within this route lies the copper belt of Zambia and the Congo. In Ch. VIII the possibility that the copper used in eastern Nigerian metal working was derived from the Congo region will be suggested along with the procurement of pygmies for the Eze Nri in Igboland. It is perhaps in this light that these Malay-Indonesian food crops can be seen as different items. Evidence from oral tradition collected by Alagoa quoted by Williamson (1970: 160) suggests that the banana/plantain arrived early enough in the delta to enter into the ritual calendar as seen in the festival of Amakoromo idu (Festival of the Banana of the Founding of the city) performed in Nembe (See Alagoa 1974).

Plantains as they are known in Nigeria are used for preparing fufu, a doughlike meal eaten with stew in the same way as the yam, cocoyam and cassava, but the banana Musa sapientum the cousin of the plantain is widely eaten in eastern Nigeria more as a fruit than as a staple . The banana does not also sumbit to the treatment as the plantain in preparing plantain cakes from the ripe fruit. The Musa cultivars like the cocoyams tolerate high humidity and both are at home in the rain forest and mangrove swamps.

(v) Maize

The native homeland of maize (Zea mays) is said to be Mexico from where it spread in the Americas before the arrival of Columbus. Although it is agreed that the maize was introduced into Africa from America after 1500 there is considerable disagreement about the route of its movement. Portérès (1955) Weathermax and Randolph (1955) argued for two routes of entry; the one directly across the Atlantic and the other from Spain by way of the Mediterranean and Egypt to Central and West Africa. Jeffreys (1955, 1957, 1971) while supporting the Portuguese introduction through the Arab world argues that this event predated Portuguese arrival to the West coast of Africa.

Maize is not a staple in any part of the eastern Niger delta and is planted in the mangrove swamps. It serves as a casual item of food at times as a dessert, at others as a hunger breaker. Its cultivation is a secondary activity and it is usually interplanted with major root crops. Maize has not yet been recovered in the archaeological context to help verify the time of its introduction in the delta.

(vi) Comparative Yields and Nutritional Value

Having considered the different categories of subsistence economic activity, it remains to compare their contribution to the diets of the groups in the Niger delta. Yams have been criticized as low in protein content, thereby making diets which rely on them unblanaced. It was shown in Chapter III that the source of protein open to the people who rely on yams are medically ade-

quate (Nicol 1952). We note from Table III.5 that although yam cultivators may depend largely on carbohydrate foods they nevertheless take a good quantity of animal and fish proteins. Table VI.16 shows the approximate yields among the cultivated food crops. In terms of their return per input in land, the cassava and plantains rank above the yam and even in caloric value the cassava still ranks above the yam. Realizing that cassava is exotic and relatively speaking a recent crop in comparison to the yam, it can be seen that yam was the dominant energy producing crop in the diet of the Niger delta. This is also supported by figures from Nicol (1952) given in Table III.4. Although the per hectare yeild of the cocoyam is small, its caloric value per 100 gm compares well with that of the yam. If, as we have seen, there is reason to believe that some species of the cocoyam was present from the first millennium A.D. and must have been supplanted by the exotic species with time, it is only reasonable to infer that both the mainland and mangrove delta zones of the Niger delta could be comfortably sustained on the crops. The evidence from the migration of some Malay-Indonesian crops, especially the plantains,cocoyam and bananas, seems to support their early introduction into the Niger delta. It could well be that they aided the yam in bringing about the economic system that ensured stability within the system and growth within the population. Clark (1976) has observed that "In Nigeria the time spent on clearing the land for yam cultivation averages 50 to 60 man/days per hectare, and in orchard bush collective teams prepare fields in less than twelve 8-hour man days per hectare. Just under half a hectare of yams is said to support a family of five for a year while the yield of cereal crops per half hectare (one acre) is barely sufficient for two persons per year' (1976: 91).

## 2. Discussion of Subsistence Patterns

In Chapter X it will be suggested that the occupation of the Niger delta was multi-directional but cardinally a north-south movement. But even if we accept the west-east movement (Alagoa 1972) as dominant there is agreement that the first occupants were probably well-used to a land environment and had well established contacts with mainland bands or settlements. Even with the initial occupation of the fresh and saltwater zones and the mangrove swamps the question was not one of isolation and dependence on the wild resources of the delta. To reason in this line would be to advocate a theory of isolation which appears contrary to the evidence from the material culture (See Chapters VIII and IX). It does seem likely that the initial occupants were concerned with winning more food resources from the environment in this case the abundant shellfish and fish. That they could have utilized the wild plant resources as we have noted (see Collecting) is unquestionable. Two hypotheses are possible: (a) that they did this before cultivation was known in Nigeria and (b) it was done after farming development. There is no evidence for (a) but (b) is documented and they probably made use of their contact with their hinterland neighbours for cultivated foods while offering them fish and shellfish and salt. We see this economic reciprocity as the vital phenomenon that accounts for the sustenance of delta population, for the increase by both human movement (migration) and natural processes (birth rates). This trend had presumably reached a state of equilibrium before the arrival of the first Europeans, during the era of the slave trade and during the establishment of normal trade contacts with Europe based on the palm oil

trade. The introduction of such exotic crops as the cassava brought about marked changes in the importance of the indigenous crops but this pehonmenon is too late in the economic history of the Niger delta to receive attention here.

The question must also be asked whether the communities of the saltwater delta zone could have subsisted on their fish and shellfish. This alternative hypothesis could be accepted for the early period, before farming developed inland, but once this had happened a lucrative alternative was open to them. The maze of creeks and lagoons made for easy mobility and communication. Even if they decided to rely on their own resources there is reason to believe that the mainland groups who were in need of marine protein resources and salt would have made contact with them. Therefore the whole process must be seen as one of a two-way movement for exchange purposes and as symbiotic in nature. In the light of Clark's observation (just quoted above) there is reason to believe that mainland and freshwater zone cultivators must have surpluses from their harvests which they would readily give in exchange for marine products. It is unlikely that the fishers and shellfish collectors would fail to utilize their advantages.

3. Site Catchment Analysis

Our site definitions (Chapter V) allow us to combine place names, numerical and alphabetical designations in recording sites as a concession to the presence of a number of archaeological features within a geopolitical territory known by a place name. Thus 'settlements' would refer to contemporary habitation territories with place names while 'sites' refer to specific archaeological features such as middens or an abandoned settlement as a unit.

The limited knowledge of prehistoric settlement patterns compels us to concentrate our discussion of catchment analysis to contemporary settlements. It has been possible to relate this to observed archaeological phenomena and attempt a reconstruction for prehistoric site catchment analysis. But the shortcomings of such reconstruction must be appreciated.

a) Coastal Site Territories (Saltwater Zone)

The manner in which coastal settlements are clustered makes it difficult to isolate a single community for analysis. As a result much of the analysis is of groups of communities.

(i) Brass River

In the Brass River area we noted that the site of Onyoma was situated at such a position that most of the periwinkle, its principal shellfish resource, was located within a kilometre radius. If the population was low before that site was abandoned and if we take into account the prolific abundance of the periwinkle (Tympanotonus sp.) in this area, a site catchment of less than four kilometres would have been sufficient for its domestic purposes although the potential of that zone is still not definite from the lack of the necessary modern statistics.

Even after Onyoma was abandoned, the daughter settlement at Nembe has continued to use the same fishing grounds and shellfish beds. There is reason to believe that economic considerations were important for the choice of the new site at Nembe (See Figure VII.1). A population increase was likely

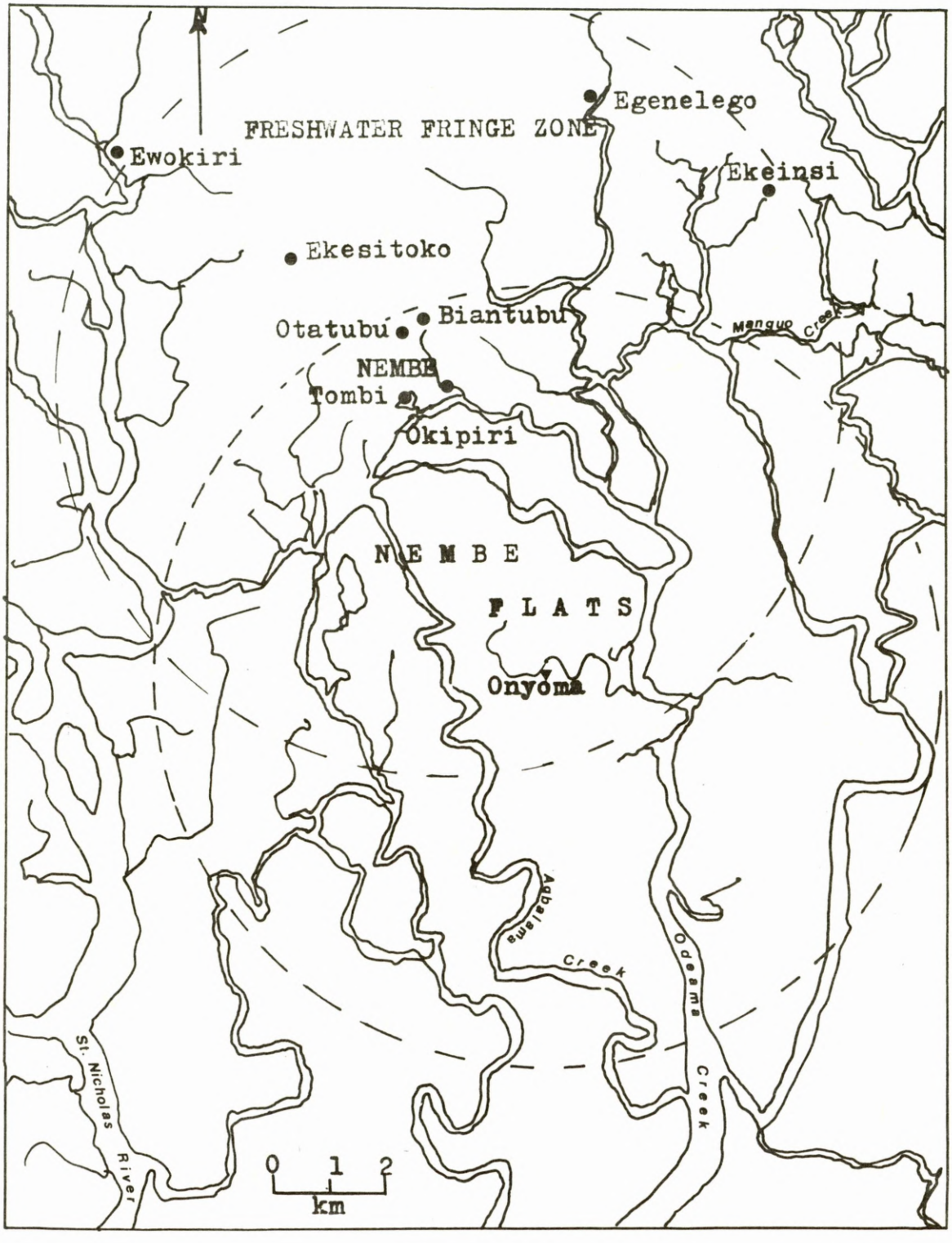



Figure VII. 1 Distribution of site territories in the Upper Brass-St. Nicholas Area. (Note the location of Onyoma and the daughter settlement of Nembe.) Half-hour territories Nembe and Onyoma are shown. See also Fig. IV. 6.

part of the reason for the movement; military and inter-group rivalry and hostility also partly accounted for it (Alagoa 1972), and by so moving Nembe acquired a new strategic and economically advantageous location. Now located at the border area of the freshwater and saltwater zones, it was in a better position to exploit the exchange networks radiating into the freshwater area. It squatted on the Brass River waterway and was accessible to points on all its flanks. Locally its exploitation range was increased, now encorporating more mangrove swamp, forest and transition zone of fresh-saltwater. Its site catchment spreads well over an 8 km radius within the Brass-St. Nicholas Rivers and the Odeama- Mangua Creeks.

(ii) Brass-St. Nicholas River Arc

Further south in the arc formed by the Brass and St. Nicholas Rivers (Figure VII.2), we notice that the site of Saikiri pogu (Ewoama) is located less than two kilometres away from the open sea. Sited on the same sandy beach as Brass, Saikiripogu was restricted to an exploitation territory on the sheltered northward side of the beach. The mangrove trees were taller and bigger than those of the freshwater zone inner coastal sites. The rivers assumed a faster flow here into the ocean and the tides were normally higher than other areas towards the mainland. Although it had the advantage of being closer to the sources of bigger fish, the risk of open sea and the possession of a low technology confined it to the safer creeks and mangrove forest territories. As the mud flats were not as expansive as at Onyoma or Nembe some 17 km north, the occupants of Saikiripogu depended on the available oyster, whelk-like molluscs, the cockle and creek-fish species.

Midden samples analyzed from this site suggest that Saikiripogu did not seriously exploit the periwinkle-rich mud flats. Preference for the whelk-like gastropods as the middens suggest, is more a reflection of the dominant species in its environment. Its inability to exploit the periwinkle beds must be seen as an inability to counter the oppressive effect of the time-distance factor. The archaeological data therefore suggest a site territory of about five kilometres in the inner creek-mangrove zone and the avoidance of the open sea and the turbulent parts of the Brass River. The site territory also overlaps with the site territories of neighbouring sites as Fig. VII.2 shows.

(iii) Sombreiro-New Calabar Rivers (Fig. VII.3)

In the Sombreiro-New Calabar Rivers group of settlements the position is not much different. The site of Ke for instance is located in the sheltered region of the River Ke and Ke Creek. Midden samples studied for this site suggest the importance of Anadara sp. at some point in the development of the site culture and the importance of the oyster as well. In fact the oyster is well represented in the later levels where Anadara sp. is no longer available in the same density as in the lower levels (Anozie 1977, pers. comm.). The explanation of unavailability as a result of intensive exploitation has been stated in a previous section (Chapter VI).

With s forest that supplied the root and fruit resources, a mangrove swamp that supplied the major shellfish sources and a good amount of fish from the creeks, Ke was well suited for exploiting these varied resources. Claimed to be the oldest site in that vicinity, Ke must have been self-sufficient at the

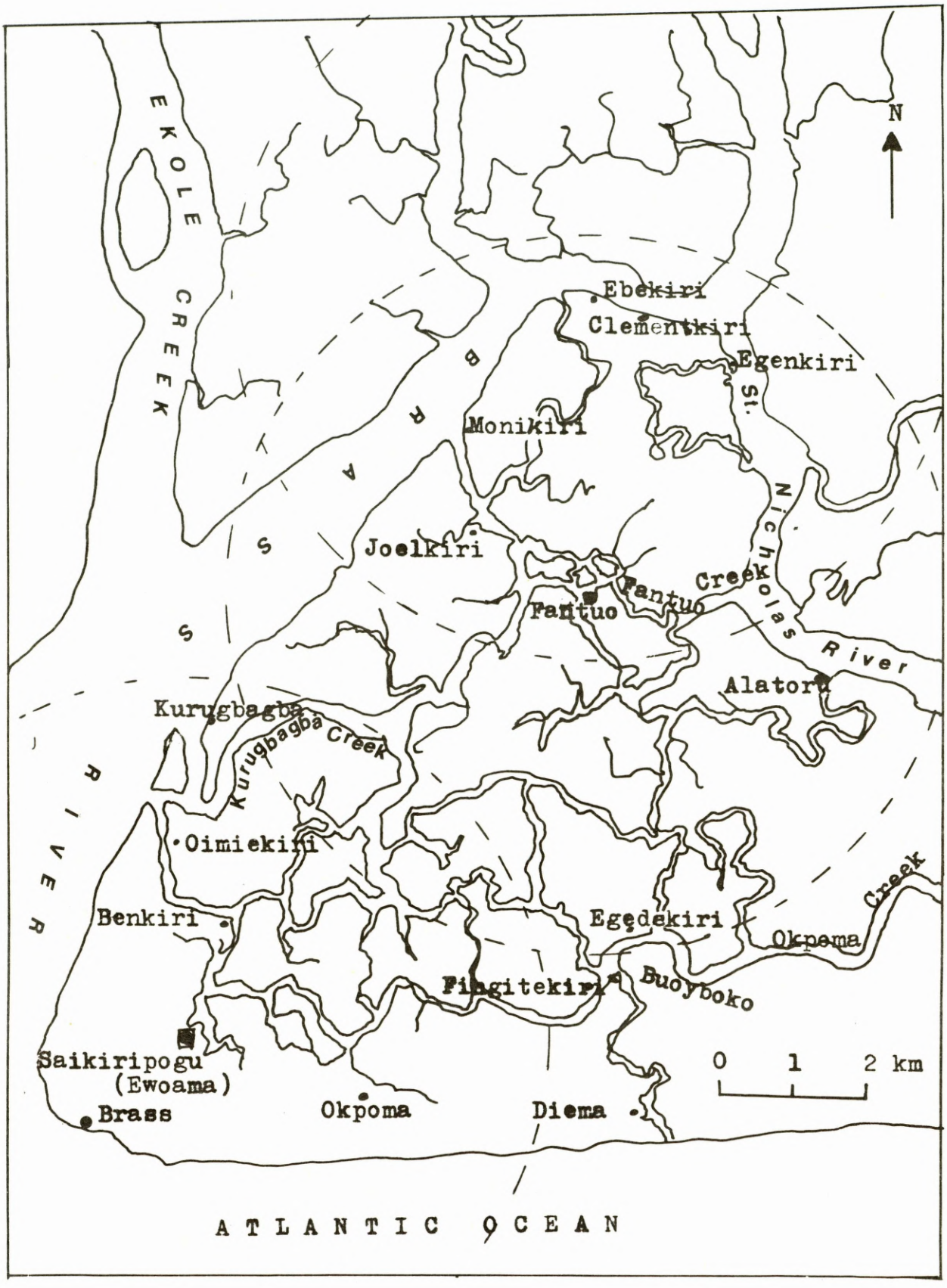



Figure VII. 2 Distribution of site territories in the Brass-St. Nicholas Rivers Arc. Note the location of Saikiripogu. Half-hour territories for Ebekiri, Fantuo and Saikiripogu are shown.


Figure VII. 3 Distribution of Site Territories in the Sombreiro-New Calabar Rivers Area. Half-hour exploitation territories of Ke and Lelema are shown. See Fig. IV. 5.

early stages but with the increase in its population, the extensive and intensive exploitation of these resources and the subsequent depletion of some, the community must have been forced to extend its exploitation range. If we assume that contemporary settlements at the early stages were few and far between then a site territory of four kilometres, which as our study shows, contains all the basic resource needs of the site, should have been adequate.

Even today the effective range of most local people hardly exceeds four kilometres although many surplus and exchange oriented fishermen and shellfish collectors go beyond an 8 kilometre radius. This, of course, must consider that only very few fishermen take to the bigger rivers and the open sea. Thus the effective exploitation range for domestic purposes should have been constrained by these big rivers. Although the present day location of settlements along the banks of these rivers is said to be a recent phenomenon arising from the intensification of 'commerical' fishing, we note again that like most other settlement sites studied the site territories overlap. Territoriality is in fact at times difficult to determine for a particular settlements as it encompasses groups of settlement.

(iv) Okrika-Bonny River

There are three classes of settlement in this area, 1) the river bank mangrove swamp settlements, 2) the island settlements, and 3) the settlements on the land at the edge of the coast. These settlements have been discussed in Chapter IV and here they are treated as a unit because they have coterminous site catchments. The first two classes of settlement are in every way similar to the previously considered groups in their site catchments and do not need further elaboration. However, it is worth mentioning that unlike the other groups discussed above, the Okrika-Bonny settlements have a much easier and direct access to inland resources than other coastal sites located in the mangrove swamps near the open sea, (e.g. Ke). But because this singular advantage of nearness to the inland resource has obvious economic and archaeological implications the settlements on the solid land at the edge of the delta are given priority of discussion below.

(v) Discussion

(a) Coast

This group of site territories in the freshwater zone comprises those settlement sites located at the inland edge of the delta and which combine fishing and farming activities. Among these are Alaocha, Ele, Ibuluya, and the Diobo village of Atako. Alaocha is such a site but because of its proximity to Okochiri the site territories overlap. Okochiri, which is today almost entirely marine-oriented, must have at one time combined cultivation with fishing/shell collecting. Atako is one of such settlements and Fig. IV.4 shows the resource zones comprising swamp, creek, woodland, groves with a network of footpaths.

From a territorial view point these settlements are the best located as they have the advantage of exploiting both the marine and terrestrial resources. Environmental, locational and ethnographic data bear this out. Although the excavated evidence is silent on the plant resources, the animal resource in the form of fish bones, land mammal bones and shells, supports the ideal and rich nature of these site territories.

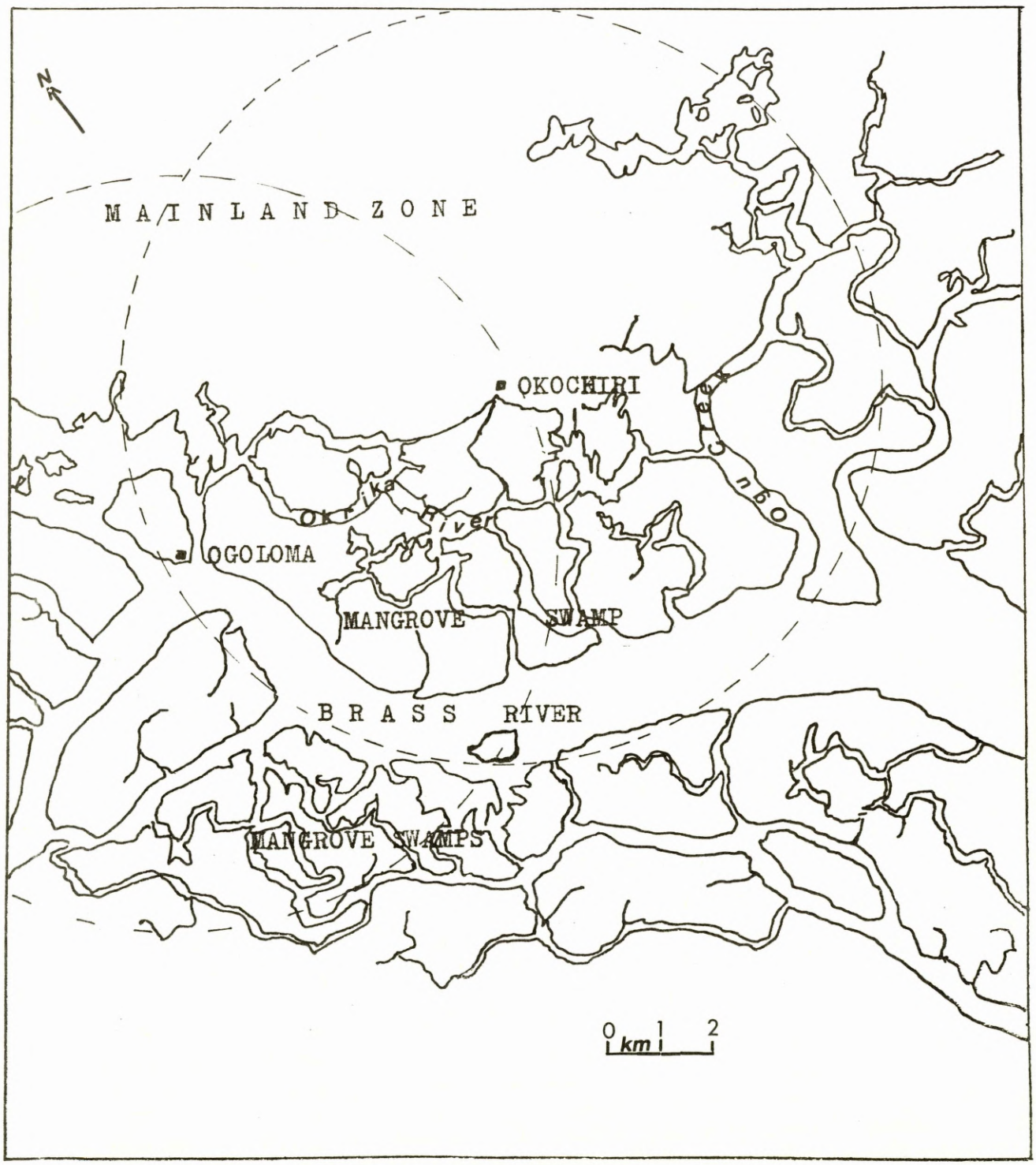



Figure VII. 4 Distribution of site territories in the Okriks-Bonny Rivers Area. Half-hour exploitation territories of Okochiri and Ogoloma are shown.

But in the case of Okochiri oral sources indicate a movement from this ideal location on the border area between land and sea to Okrika, an island within the saltwater zone. The question therefore is why such a movement would have become necessary if Okochiri was so well placed. An explanation for this is the likelihood of a decision to become fully marine-oriented. This may have arisen as a result of the need to exploit fully areas that were further away from the existing territory of Okochiri. It may have also arisen as a result of a need to be strategically located in order to enjoy the same advantages of a commercial waterway as the site of Ogoloma.

But for whatever reason the occupation of the island of Okrika carried immense traditional and locational advantages. The continuity of the occupation of Okochiri even after the movement of most of its inhabitants into Okrika perhaps emphasizes the locational and territorial importance of Okochiri.

Within individual settlements there is a clustering of middens. In Okochiri, for instance, there are three major middens (A C) and three minor ones (D-F) all within a radius of half a kilometre (See Fig. V.7). These middens vary in size from a few centimetres to five metres in height; similarly their volumes vary. Territorially these middens, as indeed in some other sites (see below) are so close together that they approximate to site focuses. The settlements within the Okrika-Bonny River complex (Fig. VII.4) illustrate the observed feature for the freshwater zone settlements just mentioned. Here the catchment contours for Okochiri encompass a number of other settlements and merge with other catchment contours. The basic resource zones are common to all of them hence they share a common exploitation territory. All these settlements obtained their domestic need of shellfish, fish and crustacea within a kilometre of their location and this is much more so for the satellite settlements (fishing ports) from which commerical fishermen went considerably further afield.

Limited excavations and dated materials reduce our ability to tell what sites are contemporary, for example, in the Okochiri midden cluster it is not clear what chronological hierarchies the six middens exhibit as surface finds are not very helpful in this direction. We are not certain therefore whether the middens resulted from contemporaneous exploitation or time-separated exploitation. Although oral sources do give some indication about relative age of major settlements the information is hardly accurate for middens. However radiocarbon dates suggest continuity of occupation on the sites, some suggest also that the middens were used one after another, but the limitation in number and direct stratigraphic alignment between the excavated middens or excavated pits within a midden do not permit the stretching of this idea (See Chronology, Chapter X).

(b) Inland

In the purely inland territories the basic subsistence economic activity is cultivation. The settlements of Eleme and northern Diobu and Onne are the closest to the coastal sites already discussed. However in the course of the fieldwork it was thought necessary to study a group further removed from the coast by some 65 kilometres.

Ogida Obibi was selected as being unaffected by the riverine economic orientation which may have altered some of these settlements closer to the sea. However, following the work of Morgan (1955) in Umuocham Aba and Atako Diobo, these two areas have been used as a cross-check on the Ogida Obibi settlements which are used here as the type sites.

The Ogida Obibi settlements show a location (Fig. VII.5) where vegetable resources were especially important. The nature of the environment and the system of cultivation bring about a quick regeneration of the vegetation so that the cultivated lands left under fallow soon revert to forest conditions after five years. In the recent past when there were fewer demands on the available land some of the lands were under fallow for upwards of twenty years (oral sources).

The importance of this is that forest conditions maintained a type of life distinct from scrub vegetation. The forest and the scrublands provided resources such as mushrooms, herbs and roots that contributed to the diet but were collected in the wild. The palm trees supplied palm fruits and nuts while the dead wood was the source of some mushrooms and also of the Rhinoceros Beetle and its larvae. The forests and 'bush' supplied the building materials, raw materials from which tools and weapons were made. The alternation of bush fallow and cultivation land meant that the resources of farm, bush and forest were available all year round. The cultivation of land immediately around the compound ensured a steady supply of domesticated vegetables.

It was observed that these farming communities located their settlements as close as possible to their fields and where the farmlands were located in different and dispersed areas the tendency had been to achieve a central location for the settlement to reduce travelling.

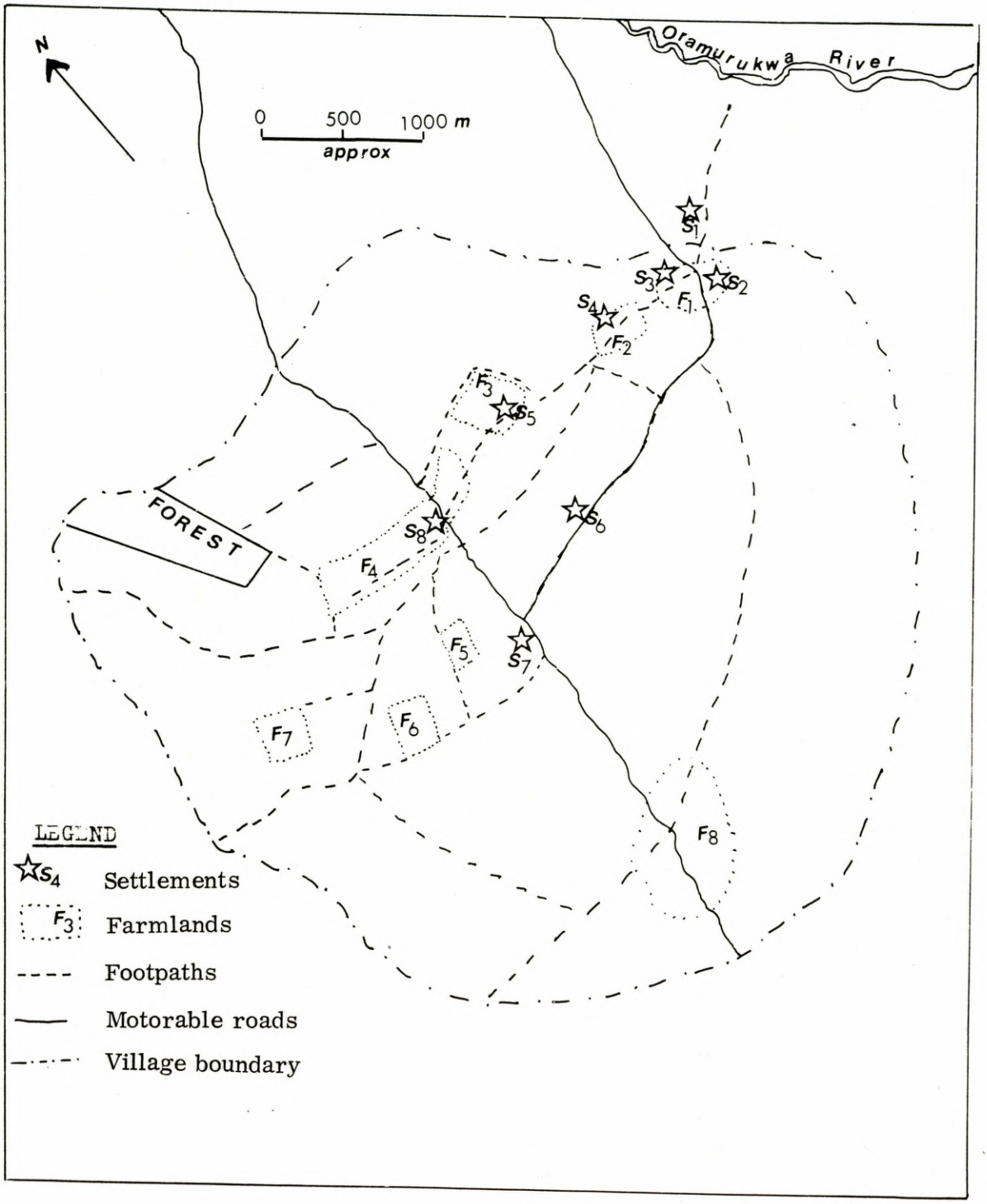
This has meant a shift in settlement locations. It is difficult to know for certain whether settlement rotation was in response to the incidence of distance occasioned by a fallow system of agriculture. The advantages of site territories in the mainland are discussed for the Ogida Obibi settlements under 'Time-Distance Factor' below.

(c) Home Bases

Two types of home bases were identified in the course of this study. The one is purely economic, the other is an embodiment of mixed economic and socio-political decisions. The former (the purely economic) is found more among fishing communities; the latter among farmers.

Among fishing communities there is a tendency for radiations to take place from 'transitory' bases which are more permanent than others. These more permanent bases may be regarded as preferred sites and in most cases equate the socio-political home bases. In most cases they were the natal homes of the fishermen, to which they have to return from time to time in the course of their activities. Depending on responsibllities, status and age, these returns may vary from a few hours through a few days and months to a year or more. In the course of long distance fishing or temporary absence, the fisherman passes through a number of other bases which acquire the status of home bases in the strict economic sense. From each of these economic

Figure VII. 5 Movement of Settlement locations and their relationship to farmlands in Ogida Emeke Obibi Owerri. Refer also to Table VII. 2. (Settlement locations and farmlands used in the study refer to Umuakabo group only.)



home bases he organizes his exploitation activities in a series of out radiations and returns for a given period of time before moving on to another. Some of these also acquire the status of preferred economic home bases and within the annual cycle the fishermen pass through a number of such home bases. We may call this series of home bases the home base cluster (See Fig. III.4).

Among cultivators, radiations and returns are more or less daily activities. They originate from a particular point in the home base which is occupied for a greater part of the year. Although settlements may be abandoned, when in use they are not left for a long time for the exploiting of distant resources. The nature of the economic activity therefore demands a more stabilized settled life from which exploitations have to be initiated.

4. Transhumance and Seasonality

From interviews with fishermen about coastal sites, territories and exploitation strategies, it became clear that a major base is psychologically essential for each fisherman. From this base, satellite ports (economic home bases) are visited for periods ranging from days, weeks to months and in some cases, years.

Long distance fishing is and probably always was undertaken by those better equipped, materially, psychologically and socially. The response of some fish species, as we found earlier, to the weather, currents, winds, ocean depths, spawning, temperature, salinity and annual floods however, bring about temporary and seasonal fluctuations in the quantity and quality of the catch. The fishermen respond to the fish behaviour by moving. Some follow a particular fish species and maximise their catch more as a result of their ability to intuitively master its habits over years of observation and experience.

As shoals naturally respond to seasonal changes and the fishermen adapt their exploitation strategy to cope with the fish population behaviour fishing gradually developed into a transhumant activity. Whether a whole fishing community completely evacuated a site in chase of moving shoals is not certain with respect to very early stages. But in the organization of long distance fishing in which transhumance is a predominant practice the nuclear family is usually involved either fishing, smoking and drying the catch in the canoe as they moved along, or setting up at satellite ports (fishing bases) where most post-catch operations are undertaken including the marketing.

The going and coming of fishermen show that fishing bases were busy almost all year round and were hardly without a resident group. The social structure of the salt and freshwater zones guarantee free mobility and integration of new groups into any community with which they can claim a relationship. While some visited temporarily and moved again other settled for good and with time the port population grew. This 'frontier' characteristic although presumably present from the early occupation of the delta must have assumed a new dimension with the development of long distance fishing.

Fishing transhumance accounts for a large part of the frontier phenomena in the delta; it must have had serious consequences: it engendered a movement of people resulting in a demographic configuration that is characteristic

of the present delta. The social interaction of different groups of people resulted in the movement of ideas. Culturally it led to closer ties and directional movement of materials.

Fishing transhumance scarcely features in the literature and whatever is available is not only scanty but also fragmentary. But it is a central theme in the development of links between the different peoples and the opening up of the delta. These links reflect to a large extent the traditional if also seasonal movements of fishermen chasing seasonal movement of fish.

It is also necessary to note, however, that the seasonal movement of fishermen in chase of moving fish shoals is but part of the transhumant activity. A greater degree of transhumance is perhaps that encountered in the variation of fishing grounds rather than that in the chase of moving fish. This is less seasonal-influenced than that of moving fish shoals and involved moving from one 'sedentary' fishing ground to another depending on the type of catches. It is in this type of fishing that there is a lot of coming and going of different communities which must in no way be confused with seasonality in the exploitation.

In the temperate parts of the world the seasonal factor in resource exploitation appears to be an accepted fact. (Coutts and Higham 1971, Higgs 1972, 1975, Bailey 1975). Seasonality in resource exploitation has come therefore to be almost synonymous with seasonality in the occupation of sites. The implications of this exploitation strategy are obvious in the archaeological record. However, although seasonality in resource availability is attested in our territorial studies, as indeed most resources are seasonally available in other parts of the world, we do not subscribe to the idea of seasonality in resource exploitation as synonymous to seasonality in the occupation of sites in the delta. The climatic phenomenon does not support such a thesis as it does in the temperate regions.

In sum, it is certain that a degree of transhumance existed and does exist in the fresh and saltwater zones of the delta as a result of the mobility inherent in fishing activities especially where long distance fishing is developed. It is also certain that a degree of seasonality exists among fishermen who have specialised in species of fish that are seasonal, but this seasonality does not imply specialised fishing grounds and the development of sites that are occupied seasonally. The sites appear to be occupied all the year round although at times by different groups both contemporaneously and one after another. Sites were hardly abandoned totally, not even the satellite fishing ports. The difficulty therefore is one of recognizing the activities of each group involved in occupying a site at a given time and differentiating this activity from those of other groups. Although this trend of transhumance operates more for satellite fishing ports where living place changes hands quickly there is a degree of stability in settlements on consolidated grounds which are essentially home bases. Seasonality is generally absent among cultivators.

5. The Time-Distance Factor

(a) Fresh and Salt Water Zone

Superficially there often appears to be a division of time between food procurement acitivities, but in actual practice the division line between one and another is blurred. For although a major food resource may be the incentive for deciding to exploit a particular region for a day, minor food items are sought after in the course of any given out-radiation and return.

In a collecting economy, for instance, shellfish collecting, the local people exploit a number of resources in combination; fishing is similarly so executed. It may incorporate a degree of shellfish collection and the collecting of wild fruits and roots. In certain cases the failure to realize a desired quantity of the one is offset by the diversion of time and energy to another resource that is more readily available.

The advantage of such combined exploitation strategy lies in the minimisation of distance and the optimisation of available time and effort. For in exploiting a number of resources in a single out-radiation, time is reduced as the same distance is traversed only once.

Analysis of the Okochiri midden content and the samples from Alaocha, Ke, Onyoma and Saikoripogu tends to show that distance was a crucial factor in the exploitation of certain resources. The oyster which is the major shellfish in the middens of Alaocha, Okochiri and Ogoloma could probably have been obtained from within 100 metres to 2 km although exploitation of these resources today entends to between five and ten kilometres for 'commerical' purposes. Although Anadara was obtained within the same environmental locality as the oyster it did not maintain a sustained yield and most likely went into extinction. This is reflected especially in the Okochiri and Alaocha shell samples. But that Anadara was prolific in Ogoloma shows that the species was still available in the area but perhaps the incidence of distance precluded its exploitation by Okochiri and Alaocha while leaving it open to Ogoloma.

In the case of Onyoma the periwinkle was obtained within a radius of two kilometres and so were the whelk-like snails at Saikiripogu. Although the periwinkle was more prolific than the whelks they were at a distance of some ten kilometres from Saikiripogu and their absence in quantity at this site can perhaps be attributed to distance. We expect a similar situation to have obtained in the case of fish resources but we are restrained from detailed comment on its exploitation because of limited identification of the fish species.

(b) Mainland Economies

In the delta-edge farming communities, territoriality in the economic sense appears synonymous with the political sense, in that each group has a defined territory within which it organizes its life and to which access from outside is regulated by its consent. The effect of distance on the exploitation patterns of a farming community is here studied at Ogida Obibi. The location of the settlement sites and their movements in the past few centuries illustrate the central forces at play in a fallow-based root-crop cultivation. The major crops are yams, cassava and cocoyams.

Table VII.2 Ogida Obibi Farm Distances from Settlement Locations (Refer to Fig. VII.5)

| Distance | 5 km | | 4 km | | 3 km | | 2 km | | 1½ km | | 1-1¼ km | | ¾ km | | ½ km | | ¼ km | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ·Total No. | ·Farmland | ·Total No. | ·Farmland | Total ·No. | ·Farmland | ·Total No. | ·Farmland | ·Total No. | ·Farmland | ·Total No. | ·Farmland | ·Total No. | ·Farmland | ·Total No. | ·Farmland | ·Total No. | ·Farmland |
| Settlements | | | | | | | | | | | | | | | | | | |
| S1 | 3 | 6-8 | | | 3 | 3-5 | | | 1 | 2 | 1 | 1 | | | | | | |
| S2 | | | 2 | 6,7 | | | 3 | 4,5,8 | | | 1 | 3 | | | 1 | 2 | 1 | 1 |
| S3 | | | | | 3 | 5-7 | 2 | 4,8 | | | 1 | 3 | | | | | 2 | 1,2 |
| S4 | | | | | 2 | 6,7 | 1 | 8 | 2 | 4,5 | | | | | 1 | 3 | 2 | 1,2 |
| S5 | | | | | | | 2 | 7,8 | 3 | 1,5,6 | 1 | 2 | 1 | 4 | | | 1 | 3 |
| S6 | | | | | | | | | 1 | 7 | 4 | 1-3,8 | 2 | 5,6 | 1 | 4 | | |
| S7 | | | | | | | 1 | 1 | 2 | 2,3 | 1 | 7 | 1 | 8 | 2 | 4,6 | 1 | 5 |
| S8 | | | | | | | 1 | 1 | 1 | 2 | 2 | 7,8 | 1 | 6 | 1 | 5 | 2 | 3,4 |
| Total | 3 | | 2 | | 8 | | 10 | | 10 | | 11 | | 5 | | 6 | | 9 | |
| % | 4.69 | | 3.13 | | 12.15 | | 15.63 | | 15.63. | | 17.19 | | 7.81 | | 9.38 | | 14.06 | |

Figure VII.5 (Ogida settlements and farmlands) shows the location of eight settlements (SI-S8) at different times in the past and their eight farmlands (F1-F8), fixed but cultivated in rotation. While F1-F8 are static, S1-S8 show a shifting development.

In Table VII.2 (Farm distances from settlement location) the changing site locations are plotted against different distances from the farms ranging from a minimum of $\frac{1}{4}$ km to a maximum of 5 km. Settlements S1-S4 show a chequered distance factor between them on the one hand and the farms on the other. The most oppressive of these distances was experienced from settlement S1 and was gradually mimimized until settlement S4 was occupied. On the contrary, settlements S5-S6 show some centralization tendency in relation to the farms and while the maximum distance walked was 2 km, we find it is for only one farmland which was used once every five years at the most. S6 was perhaps the best in terms of distance from the farms with $1\frac{1}{2}$ km as its maximum walking distance and most of the farms about 1 km to $1\frac{1}{4}$km away. However in terms of accessibility to other modern facilities such as roads and markets, S7 and S8 may be in better positions but these increased the distance to the source of fresh water.

On the available evidence it is clear that the Ogida farming community had, by shifting its settlements on different occasions, gradually but steadily reduced the influence of the time-distance factor in their daily subsistence economic activity. As casual collecting and hunting/trapping activities are also undertaken in these farmlands at different stages in their utilisation, distance is also miminised for these activities. It is not quite clear whether distance minimisation motivations were the most crucial in the decision to shift settlements; factors of demographic, socio-political and psycho-religious dimensions count quite a lot.

On a general level the pattern of shifting settlements among farming communities in eastern Nigeria follows similar lines to those of the Ogida discussed above. There is no doubt that some communities travel longer distances than those used here but a general tendency is for these to be stabilized to the extent that most of the farms are not located very far away from the settlements. In some peripheral areas, however, settlements are established in distanct farmlands, as noted in the Anambra Valley and even among farmers in the Niger and Orashi River basins. This phenomenon is responsible for the dispersed settlement patterns in some farming areas and also helps account for the low population density in the areas.

Comparatively one notes that the two micro-regional delta economies—the coastal and dry—employ different strategies to combat the influence of distance on their exploitation of resources. They however have one baseline strategy in common, that of settlement mobility. While this strategy is constrained in both by available space, it is less fluid in farming activity than in fishing/shellfish collecting activities. It is perhaps for this reason more than any other that in the dry land mobility in the exploitation of resources soon stabilizes although population may be on the increase. The 'frontier' in the coastal region still seems to keep pace with increasing population, with the result that mobility in resource exploitation even increases as a response. Thus while in the fresh- and salt-water zones intensive and

extensive exploitation strategies might be complemented with mobility to new resources the dry land is constrained by spatial limitations to intensive or extensive exploitation of a defined territory only.

6. Technology

(a) Transport

The technology employed by fishing and hunting-gathering activities has been discussed in the preceding sections but a few general remarks may be made here. The resource distribution maps, the site locations, site catchment analysis and time-distance factor analysis in the delta so far point out that the major resources were readily available and we can expect that they were reached on foot or by rivercraft.

(i) Foot

The sites of Okochiri, and Alaocha located at the northern fringe of the Okotoro are distinct from the sites located within the saltwater mangrove zone. If we accept exploitation of the creek-mangrove resources from early period then the local tradition of a time when the creeks were shallow becomes acceptable. In such early periods the people waded through the narrow creeks on foot inspecting their fish traps, visiting fishing grounds, collecting firewood and shellfish in the mangrove swamps and pools. Today this is only possible at low tide for the creeks have become incised and deep.

At such low tides today women can be seen wading the length and breadth of the creeks with baskets and fish traps filtering shrimps, lobsters, crabs, stranded fish, or collecting shellfish. These activities were also observed in the areas closer to the open seas, where the creeks were shallow at low tide. The basic tools required for these exploitation exercises were very simple and had been discussed under the sub-section 'Collecting', 'Hunting' and 'Fishing'.

(ii) Canoes and Rafts

But a difference must be made between exploitation of resources on creeks close to land in which no other form of transport except the foot was necessary and exploitation of resources on further off creeks located at points where the only bridge is an expanse of tidal or flowing river. In the latter case, initial occupation of the sites must have been made possible only by the possession of some kind of river craft.

We stated in Chapter IV that the occupation of the delta by human groups may have been multidirectional though the exact dates and routes are not known for certain. But in the settlement of the delta the use of a watercraft was probably central in the socio-economic life of some communities—a trend that has continued till today. Whether rafts were the first river crafts in use we do not know but their restricted use today and oral sources also show that they were more widely used in the past. Nor are we certain whether they antedate the dug-out canoes which now dominate transportation in the delta. They are used only to transport timber today.

Dugout Canoes have long been essential property in the Niger delta and serve not just for travelling but even as houses for some groups. They range

in size from a few metres for the one-man dug-out to the over 10 metre giant size canoes with thirty paddles and a capacity for 150 passengers (Crow 1830: 217). Most of these dug-outs are carved in the western parts of the delta mainly at Akassa where the right type of timber is obtained although the Bonny appear to have made their war canoes locally from the cotton tree. Early visitors to West Africa were impressed by the number and size of craft in use in normal civil, commercial, economic, ceremonial and military activities (Pacheco Pereira 1505: 100, 132, Dapper 1686: 316, Barbot 1732, John Adams 1823, Lander and Lander 1832: 209-210, de Cardi 1899, Crow 1830, Kingsley 1899; See Smith (1970) for the importance of the canoe in West Africa).

(b) Storage

Fish goes bad very quickly and requires some treatment if it is to be edible over wide areas for long periods. This is most important inland where transport facilities have been ill-developed and depended largely on head porterage until recently.

Traditional methods of preserving fish are smoking, drying and salting. In smoke drying, the usual practice was to lay the fish on low platforms of woven bamboo, supported about one metre above the ground. Under this fires of mangrove producing very low heat were used to grill the fish for some 4 days, every effort being made not to over-dry it on the one hand or leave it half grilled and subject to decomposition on the other. Practically all marine resources used for exchange purposes passed over the grill, although some fish was also sold fresh for immediate consumption. In the treatment of crayfish, lobsters and very small fish, perforated earthen pots were used. These were left over the oven or grilled for days. Some parts of these perforated earthen pots were recovered in the excavations (see Chapter IX).

In the cultivation economies of the mainland all transportation was on foot and the movement of goods was by head porterage away from the rivers. It was therefore an oppressive problem to travel a long distance between the farm and the store for farm products. The yam requires special post-harvest treatment and good storage if it were to remain good for domestic use and for the next planting season. The yam barn was developed to cater for this need. If in the various stages of cultivation, settlements moved to farms, we could expect that the barn was highly localised in the homes of individuals or sited in their farms. In a limited survey carried out in Owerri in 1976-77, information from local farmers shows that distant farms had barns developed for them. These attempted, perhaps, to reduce the effect of distance and weight. The tendency recently has been for families to locate their barns within their compound walls for greater security and ease of access. For the Ogida group still under study, the decentralization of the 'bush' barn becomes the more advantageous with most of the farms located some distance from the present settlements.

# CHAPTER VIII

# MATERIAL CULTURE

## INTRODUCTION

The aim of this chapter is to demonstrate archaeologically the use by man in the Niger delta of the resources of the environment. The archaeological evidence from this aspect of human behaviour (usually referred to as 'artefacts') has been defined as trangible remains from raw materials which may be organic or inorganic. The survival potential of either therefore determines to a large degree its place in most archaeological reconstructions and interpretations.

In the present analysis of Niger delta material culture the artefacts have principally been classified according to the nature of the raw material. The sub-divisions are those that relate to specific artefacts which inform about the type of behaviour embedded in the artefact. The economic aspects of human behaviour which these artefacts generate in archaeological interpretations have already been presented in Chapter VII.

### 1. Mammalian Raw Materials

#### a) Bone Artefacts

Objects made from animal bones are rare. It is likely that the Niger delta peoples did make use of objects in bone but only one animal bone has been recovered from the excavations. This object comes from a Phase III site, Ogoloma, (Table X. 2) and shows definite evidence of having been worked into a tool. It uses the full length of the bone size and has been ground into a rasp-like face which shows that the bone had first been split into two halves before the inward face was worked. Its purpose is not immediately apparent, although an encrustation of ferrous coloured stains runs over most of it. No parallels have been found for this tool.

#### b) Tooth

The only known artefact from a tooth is the leopard canine, kuronama, found at Onyoma (Fig. VIII.1). It was pierced in the centre from both sides and was probably a pendant worn on the neck, wrist or leg. The tooth is associated in the same level with a cowrie shell, in fact the only one from the excavations in that area. The priests of Nembe still wear perforated leopard teeth on their necks and wrists as part of their ritual regalia. In the hinterland parts of eastern Nigeria, animal teeth are also worn for ritual, religious and social reasons especially by distinguished men. The leopard symbolises strength, achievement and power. A comparable though more artistically stylised parallel is the pierced bronze tooth found at Igboukwu (Shaw 1970).

Figure VIII.1 Pierced Animal Tooth from Onyoma I

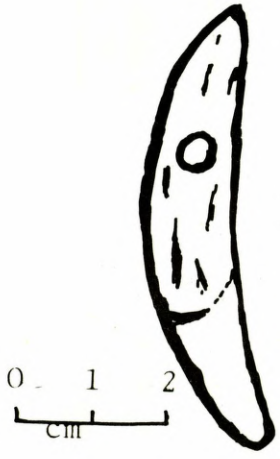
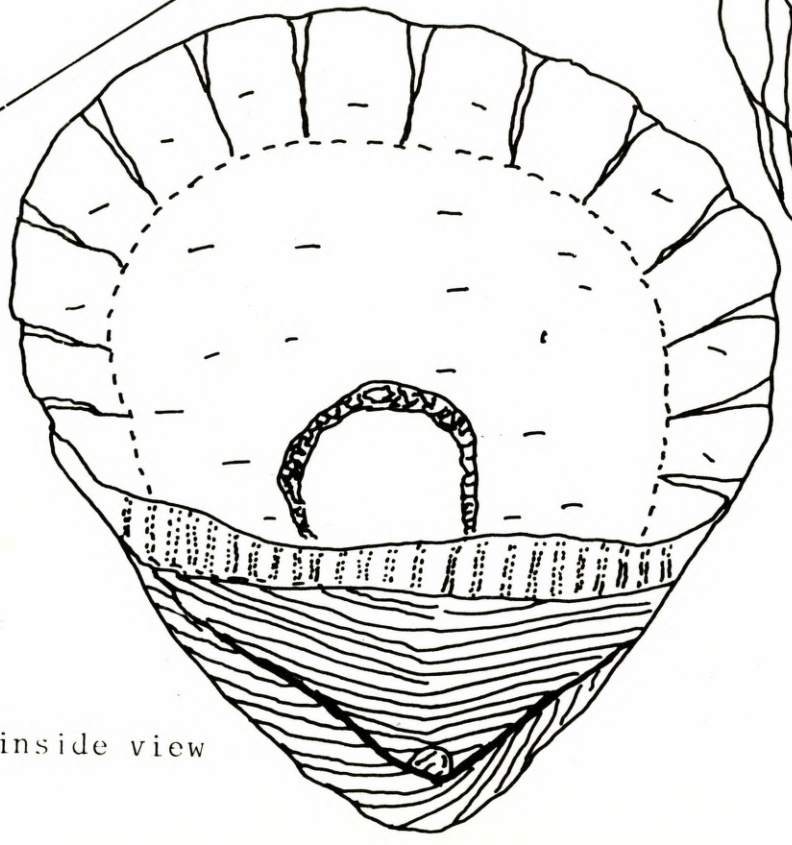
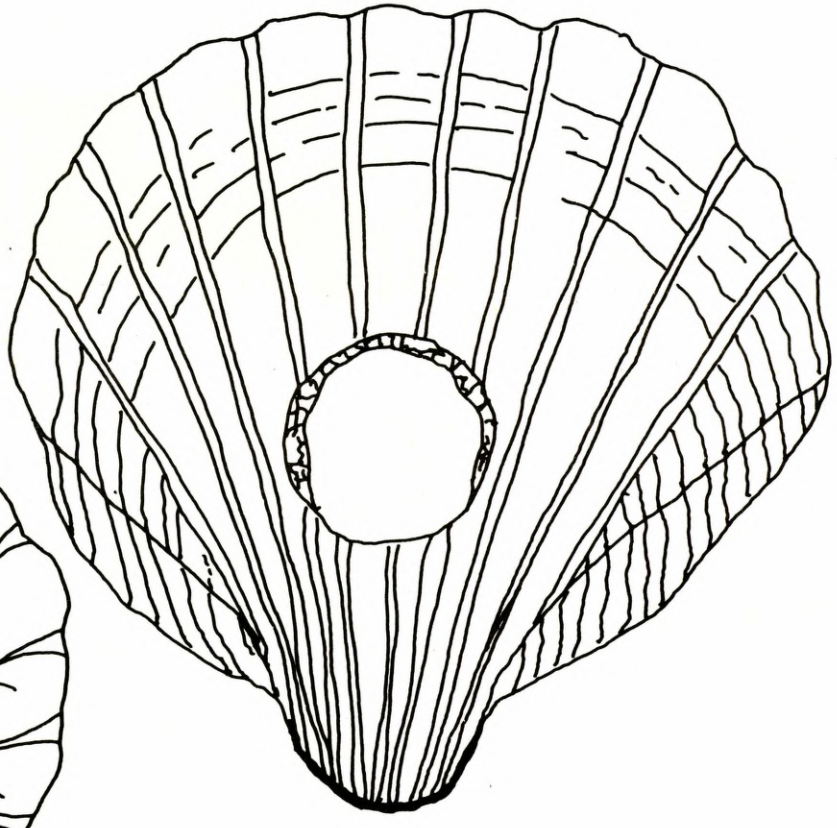



Figure VIII.2 Perforated Cockle (Anadara senilis) Shell (see also Plate 9)




a) inside view



b) outside view

2. Fish Raw Materials

a) Bone

A number of fish bones recovered from a Phase II site, Okochiri, show signs of wear but as no perforations have been identified it is not likely that they were used as bone needles and fish hooks although fish bones may have been used for these purposes in the past (Floyd 1969).

b) Shell

Although artefacts in shell are not common in the delta, all the excavated delta sites nevertheless show evidence of the use of shells for domestic, ornamental, industrial and ritual purposes.

The predominant evidences of use are the perforation and edge wear on shells: (i) Perforations of the cockle, Arca senilis, ifugo and whelk, Thais sp. were made at the centre or at the hinge of the valve. In some cases the perforation is rough especially at the hinge, suggesting perhaps that not all the perforated Arca and Thais were used for ornamentation. It is difficult to imagine that the perforations were made to string the animals to prevent their escape as is usually done to the giant African land snails, for Arca and Thais are more sedentary than the land snails and holes are not indicative of butchery practices (see Figure VIII.2). In Ogoloma perforated Arca shells are still in use today (Anozie 1977, pers. comm.) suggesting cultural continuity. (ii) Arca shells also have well-worn edges which suggest a different form of utility—possibly as rubbers and for cutting up some soft, light materials. In the ceramic industry they were used for decorating, smoothing and rouletting pots and when pounded as their tempering material. Shells are also used in the preparation of chalk paint. Chalk stains inside pots from the Phase II sites of Ke and Saikiripogu and the recovery of two small egg-shaped cakes of chalk at Onyoma confirm the manufacture and use of chalk in the Niger delta. Chalk is used in rituals all over eastern Nigeria as a symbol of peace and friendship and as body and face paint today.

One cowrie shell was recovered from Onyoma. In the light of written evidence about the widespread use of cowrie shells as currency in West Africa before the arrival of the first Europeans (Jeffreys 1938: 223) it is not possible to say for certain whether the associated leopard tooth is recent until more is known about the two types of cowries in use in eastern Nigeria and to which this single shell is related. Perhaps it needs to be mentioned that the cowrie appears to have been used as local currency in the western delta between c. 1600 and 1650 (Jones 1958, using data from Dapper 1966) and not in the saltwater eastern delta at all. Their closeness to each other makes it likely that the cowrie could have strayed into the east delta from the west.

3. Vegetable

Because of the quick rate at which vegetable matter perishes it has not yet been possible to recover any artefacts of vegetable matter from excavations. Recognizing the dearth of direct archaeological evidence the reconstruction attempted below is based on reports of early travellers, traders and researchers' observations. The limitations of such an approach are recognised but the probable continuity in basic artefactual material justifies such speculation.

a) Wood

In a gathering-fishing-hunting economy where stone materials are absent it should be expected that many artefacts would be of wood, especially digging sticks. Even when iron came, handles of tools such as knives, sickles, hoes and hammers would have been of wood. Similarly, for pre-iron agricultural economies, it is likely that the implements were partly of wood.

In the recreational and ritual arts, masks and models in wood are still important religious items. The art of wood sculpture may have been the forerunner of delta terracotta art (this is further discussed below).

As containers, wooden vessels and bowls were used for serving and storing food while wooden spoons and ladles were also used for eating and serving food. Twin-wooden dishes were observed as an item of cultural importance at Umueje in the Anambra Valley in the course of field survey in 1977. The wooden pestle and mortar for grinding and pounding should also have facilitated the utilisation of most tubers, leaves and grains as food materials.

b) Leather

This is little used today and was probably always rare, especially as the right type of raw material was lacking.

c) Cloth

The eastern delta appears to have got cotton cloth from the Ijebu further west in Yoruba land (Alagoa 1970). On the Niger the Igbo of Asaba and Onitsha also make bark cloth and on the Imo River the Akwete Igbo are excellent weavers in cloth and there is reason to believe that by trade these sources would have satisfied delta demand before the importation of European cloth there about the 17th century.

4. Minerals

The major mineral raw materials utilised today in the area of this study are metals, salt, stone, clay and glass. The use of clay for pottery will be the subject of the next chapter (Chapter IX) while salt has been mentioned in Chapter VII, further in Chapter X).

a) Stone

Materials in stone are generally absent from the Niger delta shell middens and ethnographic information obtained within the field seasons does not change the state of our knowledge about stone tools in the Niger delta. There appears to be a general lack of need for stone objects. The geological structure of the Niger delta and its immediate hinterland is devoid of suitable minerals or rocks useful to man other than pottery clay (Chapter IX). As a result therefore stone objects were not widely known from Phase II sites. The known occurrences at Ke (a Phase II site) were two crude haematite 'cores' recovered along with a 'ground fragment' from the surface. However four unworked but exotic stones were observed at the shrine of Opujaja at Ke in September 1977 during a revisit to the town of Ke. These were probably haematite and are generally of the same nature as those associated with shrines in the hinterland commonly referred to as thunderstones or thunderbolts (see also Connah 1975: 109-110 and Shaw 1978: 45). About 13 stone fragments were recovered from

various levels of the Phase III/IV Ogoloma midden. The earliest, from the lowest level of cutting IA are associated with the C14 date of A.D. 1345 ± 100. Of the two from this level, one is bored lengthwise although part of it is broken. It is not certain what it could have been used for. Similarly there are three others from Phase IV which are smoothed probably by use, probably of sandstone. Eight others are crude unshaped fragments of sandstone and their utility cannot easily be ascertained (see Table V.1).

Although stones are associated with ritual practices as shown, the possibility that they have been used for agricultural or forest clearing purposes has also been suggested (Connah 1975: 112); the Niger delta stone fragments are not 'polished' or 'ground' stone axes in the real archaeological sense. They are neither 'polished' nor 'ground' and their utilisation as agricultural tools is not likely. However, there is today a widespread use of stone (sandstone) within the 'oil palm culture' zone of eastern Nigeria as a palm nut (palm kernel) cracker. Among the Owerri Igbo in the immediate coastal mainland of the Niger delta the usual practice was to turn the domestic wooden mortar upside down and use the closed end to balance the palm kernel while cracking with the stone tool. The effectiveness of this practice made the stone tool one of the most prized domestic items and the external appearance of the stone had no direct relation to its effectiveness. It is in this light that the crude cores must be seen, because the ritual stones appear to have aesthetic appeal.

The exact source of these stones is not known but they are expected to have derived from sources in the Okigwe-Nsukka range where rocks are a general feature of the landscape. Thus an early connection can probably be seen between the Niger delta and the northern hinterland as early as the 13th century A.D.

b) Metals

No metallic ores are found in the delta so that the reconstruction of the development of the use of metal objects poses particular problems. This is made worse by the scarcity of the occurrence of metal artefacts in archaeological contexts, but it will be improper to conclude from this scarcity that they were unknown in Phase II and III. What seems probable is that despite knowledge of the existence of metal at a distance there was no real need for it in local social and economic systems. Such evidence as there is lends support to the idea that some objects were imported as finished products from the artisans—a system which had advantages over importing the raw materials for local manufacture. With this in mind this section not only presents the evidence and the significance of the objects, but also tries to survey the connection between the delta and its hinterland.

(i) Iron

Iron is unlikely to have reached the delta before the 1st millennium A.D. However, there is evidence that iron was known if not worked in the delta early in the 2nd millennium A.D. At Ke I eight fragments of iron slag, a nail and parts of clay tuyères were recovered. From the top layer of Onyoma III there were a piece of iron ore (haematite), a bloom of iron and pieces of slag suggesting metal working (Alagoa 1976). At Saikiripogu tuyère parts were recovered but no iron objects were associated. From Okochiri a bloom of iron was recovered from the top level of Okochiri IV (Table V.1).

With respect to the source of the raw material, geological evidence shows that iron ores do not occur in the Niger delta. The nearest source is some 250 km north in the Udi-Nsukka plateau. Since some ores were brought into the Niger delta in a raw state, it implies that the iron ore was moved over this distance by head porterage or by boats in appreciable quantities since it must have satisfied furnaces to produce blooms and slag. Although there is no data on the demand for iron at any time it is most probable as in the 19th century that raw ores were smelted in the hinterland and brought into the delta as blooms and artefacts.

It is perhaps surprising that there has been an absence of appreciable quantities of iron objects in the 16th-19th centuries A.D. levels of the delta sites. This may perhaps be explained as indicative of general lack of need or the preciousness of the objects. Ethnographic evidence shows that in the 19th century it was used for needles, axes and fish hooks. Some manillas were also made of iron and are discussed in the section on manillas (Group I).

(ii) Copper

It is possible to distinguish three types of objects made in copper by the degree of their copper content: Pure copper; the addition of tin, sometimes with lead and arsenic to copper, results in Bronze; while a further addition to these of a substantial quantity of zinc produces Brass. Objects from the delta have not yet been analysed as were those from Igboukwu, Benin and Ife, so the scope of this study is limited firstly to the types of objects found and secondly to their significance in recent socio-political and economic life of the delta. We shall refer to these objects as of 'copper' until we know more about their composition.

Table VIII.1 presents graphically the main types of copper and copper-alloyed objects found in the delta. Only very few come from archaeological contexts as the table shows. Among these is the coiled ornament recovered from a burial at Phase III site, Onyoma (Figure VIII.3). It is similar to the iruka which is used today in the Niger delta and parts of the mainland as a symbol of wealth, high social and religious standing. It is of local manufacture (Alagoa 1976) and comes from a level just below one dated 1460 $\pm$70 A.D. Variations of this object were observed in use at Okrika during the Aria or pre-marriage initiation ceremony for girls in 1976. The Igboukwu evidence shows a variety of related coiled bronze ornaments of the 9th century A.D. (Shaw 1970). A related object described as 'biconical spiral copper bead or spindle whorl' (Anozie 1973) was recovered from the Phase III site at Ke. It is not certain what this object was used for (see Figure VIII.4).

(iii) Manilla

These penanular rings in copper or copper alloy occupy an important place among metal objects found in delta excavations. Because the manillas have often been discussed elsewhere (Ryder 1972, Jones 1958, Anozie 1976c) only the most salient points in their analysis and interpretation will be made here. The largest single find of these objects (846 pieces) which made up about 285 whole manillas calculated from 570 extended terminals, come from the top layer of the Phase III site of Ke I—what Anozie calls the 'Manilla layer' (0-25

Table VIII.1 Some Objects in 'Copper' found in the Niger Delta

| Location | Context | Insignia | | | | Human Figures | | Animal Figures | | | | Ornaments | | | | | Other | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Sword points | Stool | Staff | Bell | Human figure | Mask model | Animal tooth | Animal fig. | Animal skull | Serpent | Bracelet | Pendant | Cylindrical coils | Rings | Spiral coils | Manilla | Unidentified |
| Eastern delta | | | | | | | | | | | | | | | | | | |
| Onyoma[a] | Ex | | | | | | | | | | | | x | | | | | |
| Okpoma[b] | | | | | | | | x | x* | | x* | | | | | | 15 | |
| Ke[a] | Ex | | | | | | | | | | | | | | | | 287 | |
| c | Sh | | | | | 3* | | | | | 2* | | | 3 | 2 | 2 | 21 | x |
| Teinma[b] | Sh | x | | | | | | | | | | | | | | x | x | x |
| Ogoloma[a] | Ex | x | | | | | | | | | | x | | | x | x | x | |
| Omagbele[c] | Sf | | | | | | | | 4 | 1 | | | | | | | | |
| Odioma[b] | Sh | | | | | x | | | | 1 | | | | | | | | x |
| Amatu[b] | Sh | | | | 4 | | | | | | | | | | | | | |
| Western delta | | | | | | | | | | | | | | | | | | |
| Akugbene | Hs | | x | x | | x* | | | x* | | x* | | | | | | | |
| Kiagbodo[b] | Hs | | x | x | x | | 2 | | | | | | x | | | | | |
| Nikorogha[b] | Hs | | | x | | 2* | | | | | | | | | x | | | |
| Sagbama[b] | | | | | x | | | | | | | x | | | | | | |

Data source
a Anozie's excavation
b Horton (1965)
c My field observations

Context
Ex Excavated data
Sh Shrine
Sf Surface
Hs Private possession
* As relief on object

Figure VIII.3 Spiral Coiled 'Copper' Object from Onyoma (See also Plate 35)

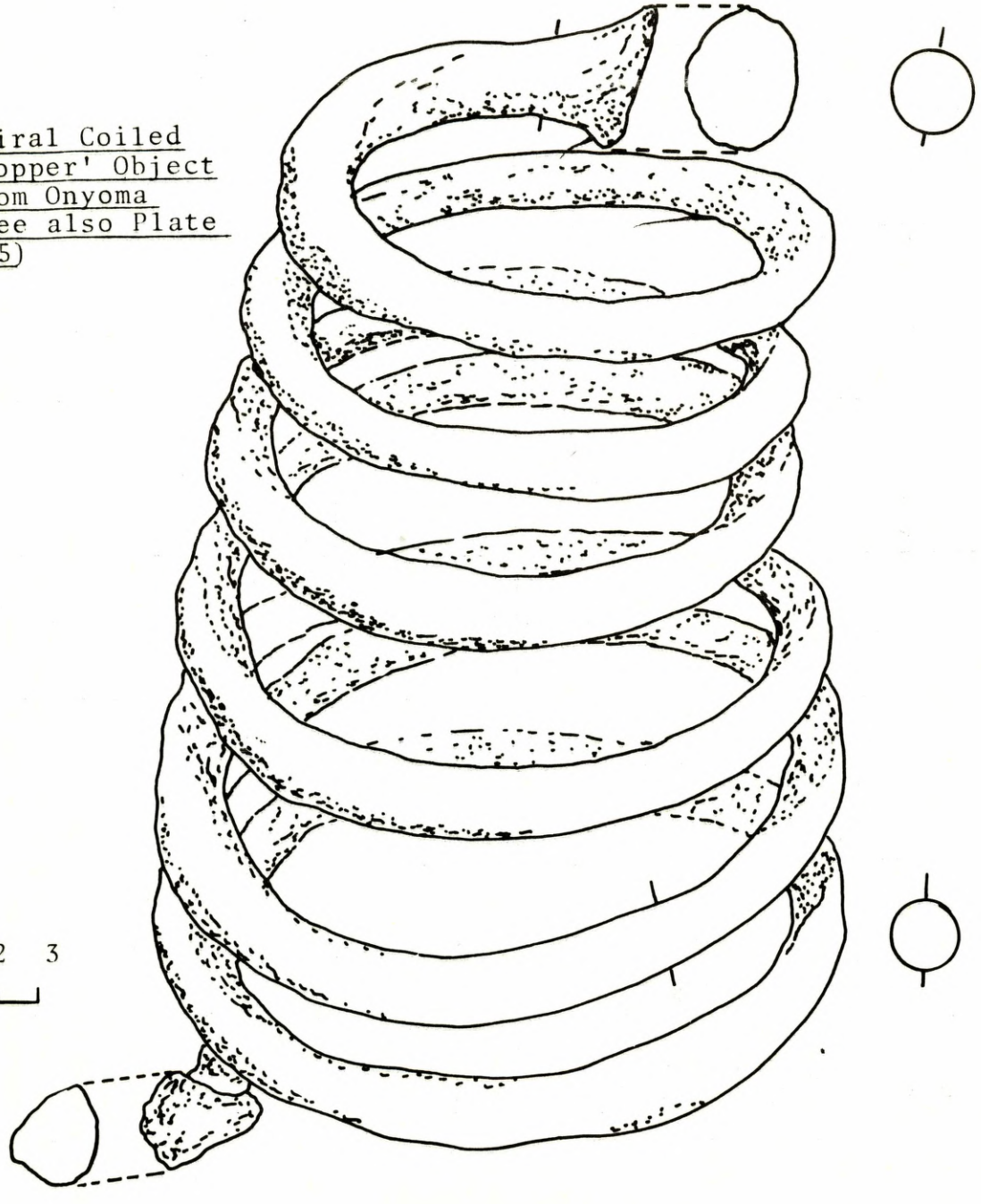



Figure VIII.4 Biconical 'Copper' Object from Ke

cm). Although the level is not dated, they were cast and most probably European in origin, and may have been broken for recycling by local smiths. This explanation would account for the identification of crucibles and moulds from Ke.

The problem is further complicated by what Anozie (1973) has identified as 'tuyères' from Ke. Externally they resemble tuyères but are small cones, for the complete ones are open at the broad end only (except for others which happen to have been broken at the tapering or narrower end). If they were crucibles their presence or association with larger thick-walled moulds becomes understandable. Although there were a few of the crucible-like tuyères with apertures at the narrower end, they contain in most cases traces of chalk stains and are much larger, in fact over three times the size of the smaller cores. Oral information obtained in the September 1977 field season does not connect these objects with metal working but recognised them as oil lamps. It was equally difficult to accept them as such. Although the use of these long thick-walled, semi-tapering wide-mouthed objects is far from certain, they appear to have been used as moulds in some form of metal working.

By analysing the raw material, workmanship, size and finish of delta manillae, three broad groups have been recognised. Table VIII.2 sůmmarises the grouping of 12 selected manillae and the criteria of their types. Group I are the iron manillae which in other respects are close to Group II. Group I have an average weight of 55 gm; 2.23 cm maximum terminal diameter; 1.08 cm maximum middle diameter and an average overall length of 16.67 cm. Group II may be called normal size 'copper' manillae with an average weight of 80 gm; 2.3 cm maximum terminal diameter, 1 cm maximum middle diameter and an overall average length of 16 cm. Group III are the giant manillae also referred to as the 'King' or 'Queen' manillae with an overall weight of 4 kg; a maximum terminal diameter of 5 cm; maximum middle diameter of 4 cm and overall length of 54 cm (see also Figure VIII.5).

A number of other objects in copper or alloyed copper have been recovered from various parts of the Niger delta. These are insignia of the western delta types comprising swords, sword hilts, stool, sticks and bells and human and animal replicas found in eastern delta contemporary shrines. All these are summarised in Table VIII.1 using material from Horton (1965), Alagoa (1972) where they have also been discussed. They indicate a Phase III development.

(iv) Sources of Copper and its Alloys

Copper

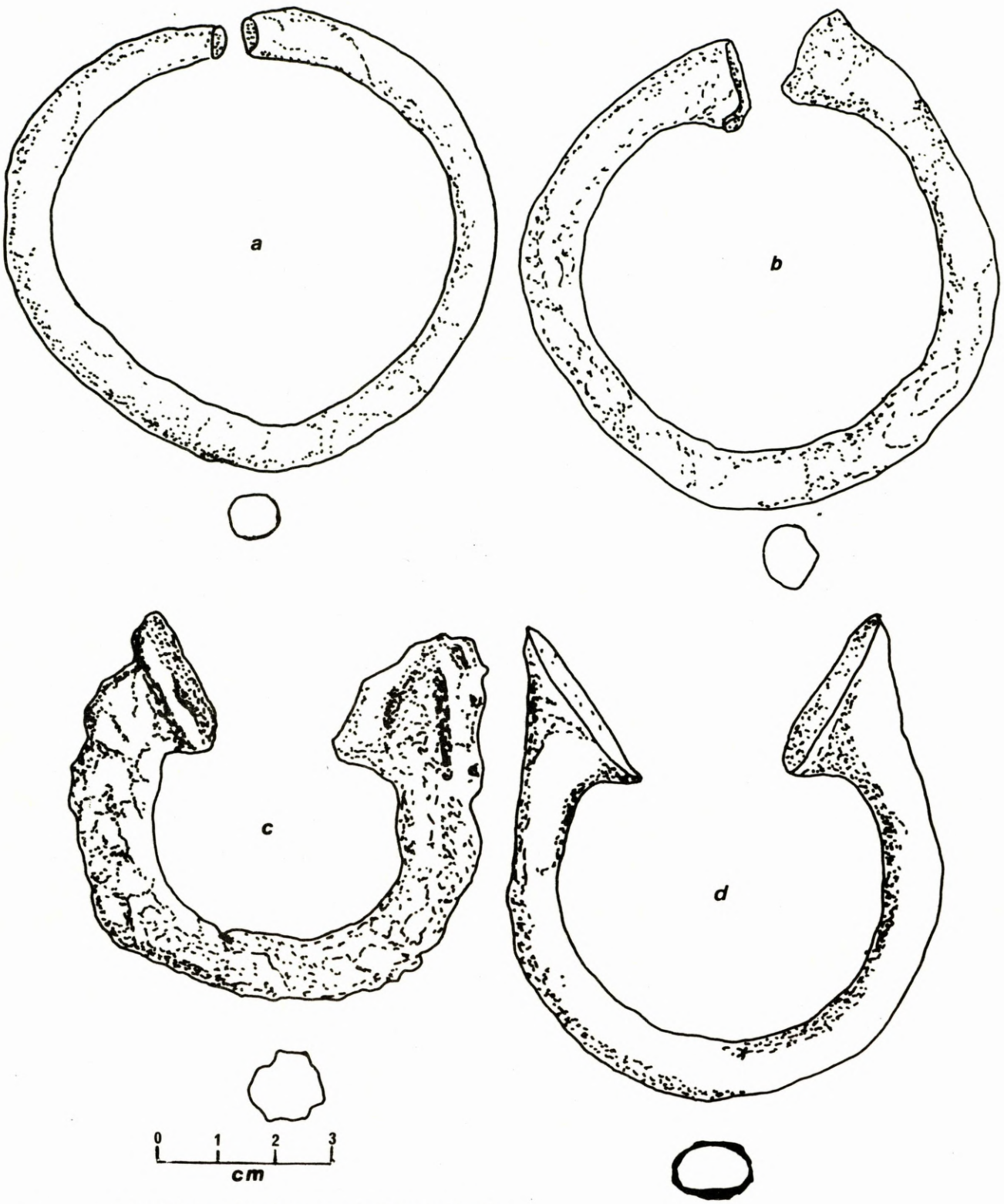
Until recently it had been thought that external ores must account for the presence of the copper found in Nigeria but a closer look at internal resources has raised the possibility that copper may have been obtained from east of the River Niger. By the collaboration of an anthropologist (Onwuejeogwu), a miner (Chogu) and a geologist (Bafor), it has become established that copper was available in Abakaliki and that there is evidence of ancient working (Onwuejeogwu 1976).

More distant sources of these ores may also have been used. Various oral sources relate to the procurement of dwarfs and pygmies for the Eze Nri in Awka, from parts of the present Cameroons and Zaire in the past—a

Table VIII. 2 Classification of Manillas from Ogoloma

| | Weight | Max. Terminal Diameter (cm) | Max. Middle Diameter (cm) | Overall Length (cm) | Size | Raw Material | Groups |
|---|---|---|---|---|---|---|---|
| 1 | 80 | 2.6 | 1.3 | 18 | Normal | Iron | I |
| 2 | 60 | 2.6 | 1.0 | 17 | | | |
| 3 | 45 | 2.0 | 1.2 | 17 | | | |
| 4 | 45 | 2.0 | 1.0 | 16 | | | |
| 5 | 50 | 2.0 | 1.0 | 16 | | | |
| 6 | 50 | 2.2 | 1.0 | 16 | | | |
| 7 | 100 | 2.6 | 1.0 | 19 | | Copper | |
| 8 | 80 | 2.2 | 1.0 | 16 | | | |
| 9 | 80 | 2.4 | 1.0 | 16 | | | II |
| 10 | 70 | 2.3 | 1.0 | 15 | | | |
| 11 | 60 | 2.0 | 1.0 | 15 | | | |
| 12 | 4000 | 5.0 | 4.0 | 54 | Giant | | III |

Modified from Anozie 1976c




a Manilla without expanded terminals
b-d Manilla with expanded terminals
a,b,d 'Copper' manilla from Ke
c Iron manilla from Ogoloma. Probably cast. Note the rust on the surface
a,b Probably not cast but locally made. Note uneven surface
d Cast

Figure VIII. 5 Manillà from the Niger Delta

connection that was likely to have led to a trade in other materials including copper (Anozie 1977). There is the equal possibility that the Middle Niger source may have been utilised from the 1st millennium B.C.

Tin

Pre-16th century A.D. use of the tin resources of the Jos plateau is certain and may have reached the delta then as it did in the 19th century (Fagg 1946).

Zinc

Zinc occurs in the Abakaliki area. According to the mineral map of Nigeria 1935, this zinc is leaded (Nigerian Handbook 1936: Map opposite p.112) but it is not known to what scale it was exploited by natives in pre-European contact periods.

Early European traders confirm that an exchange system using 'brass' and 'copper' as scales of value existed in the delta before their arrival (Barbot 1732, Jones 1958). Copper smithing tools (crucibles, moulds—see Chapter IX) tend to suggest they were produced by locally based smiths. The Europeans therefore adjusted their trade patterns by mass producing and importing to the area, the materials valued. Imported copper bars (Barbot 1732: 627) must have facilitated the production and wider distribution of objects in copper and recycling seems to be a common phenomenon in the copper-working industry. Most of the small objects could easily be melted down and turned into others of higher demand. In some cases the local smiths experimented with making the same objects in iron, for example some manillae recovered from Ogoloma were made of iron (Group I)—a reflection either of some degree of scarcity in copper/bronze/brass or perhaps the first deliberate attempt to include iron into the exchange system as currency (Anozie 1976c).

The known traditions of copper and bronze working in eastern Nigeria began at Igboukwu and were far advanced by the 9th century (Shaw 1970). Early visitors to eastern Nigeria from the 17th century A.D. observed two groups of smiths—Awka and Nkwerre (Baikie 1856, Leonard 1906, Basden 1938, Thomas 1913, 1918, Talbot 1926: 111, Meek 1937, Jeffreys 1937, Basden 1966). There is reason to think that the metal was significant for the eastern delta. Dapper (1686: 315), Barbot (1732) and Horton (1965: 89), based on 'vague Kalabari traditions', record working in copper in the eastern delta. Dapper writing about the delta earlier noted that the "blacks of Calabary work with much art ...splitting the bar...which they polish as fine as gold and twist...together very ingeniously into cords to make what form of arm rings they please" (Barbot 1732: 627). Recent research suggests similar 17/18th century working on copper and bronze in other parts of eastern Nigeria such as Abriba (Ekejiuba 1967), Nsukka (Afigbo 1972, Anozie, pers. comm. 1977). In the 'dryland'-delta edge zone metal agricultural tools could have been important economically and in the fresh and saltwater zones for wood cutting and canoe making.

Studies among Awka smiths (Neaher 1976) confirm the itinerant nature of Awka-smithing activities and have helped to put into perspective the range of their "peregrinations in servicing communities of varied ethnic composition" alluded to in published works. What is not clear however is the exact composition

of their trade-wares and the contribution of other groups of smiths, not yet well studied, to the range of objects now found in the east and west of the delta in the 19th century (see Figure VIII.6). Although no full scale comparative study of copper-bronze-brass working in Nigeria has been carried out, one can tentatively postulate that four external sources may have been responsible for the presence of some of these objects in the eastern delta in the 17th and 18th centuries: a) from local hinterland smiths east of the Niger (Awka, Nkwerre, Abriba, Nsukka); b) from the west delta area (possibly Benin/Ife metal workers); c) from the middle Niger-middle Benue confluence (see Rubin 1973, Shaw 1973); d) European imports. The existence of local east delta industry shown by the works of early writers and the presence of crucibles and moulds should be credited with some of the armlets and anklets within the collection.

(v) Contexts of the Finds and their Significance

Four archaeological contexts can be identified for the objects summarised in Table VIII.1—shrines, houses, middens and graves. The context not only helps us to determine the distribution of the objects but also helps us to attempt a reconstruction of their significance. On typological criteria, the objects, although differing slightly, divide conveniently into five types, partly according to their physical appearance and partly to their use: a) insignia, b) human figures and reliefs, c) animal figures, d) ornamental objects, and e) others. Some measure of oversimplification arises from this typology for instance the spiral coils from Ke may not strictly speaking be ornamental as they were perhaps not worn.

In the societies under study there was probably then as later no clear-cut distinction as we know them in western societies today of social, political, economic and religious status. It should be expected that rare metal objects show "tendency for values of religious, political, social and economic potency to overlap, coexist and converge" (Neaher 1976: 58).

Religious/Social Usages

Today the majority of the objects of types (b) and (c) above are found in shrines and religious houses where they are associated with worship of some deity. When in private hands their possessor is normally associated with some water spirit who is said to be responsible for making them. As a result these objects have wide influence when used in masquerade dances (Horton 1965: 77). Although this performs a social function, its raison d'etre is a religious one. It is only thus that one appreciates their use as masquerade paraphenalia in the eastern Niger delta (Horton 1965: 82, Alagoa 1969: 55-56) and in Benin. At Igboukwu examples are found in the 9th century A.D. contexts.

Socio-Political

Metal objects of types (a) and (d) such as bells and staffs were used among the Nsukka Igbo to denote and differentiate social ranks. Such ranking has also been identified among the Ijebu Yoruba (Neaher 1976: 59). In Table VIII.1 we note that the stools, staffs and bells which predominate among western delta copper objects and point more to political and social status than to religious utility, are from the available data conspicuously absent among the eastern delta finds. These insignia are said (Horton 1965) to derive from political

Figure VIII.6 Sites of 'Copper' Object Finds in the Niger Delta

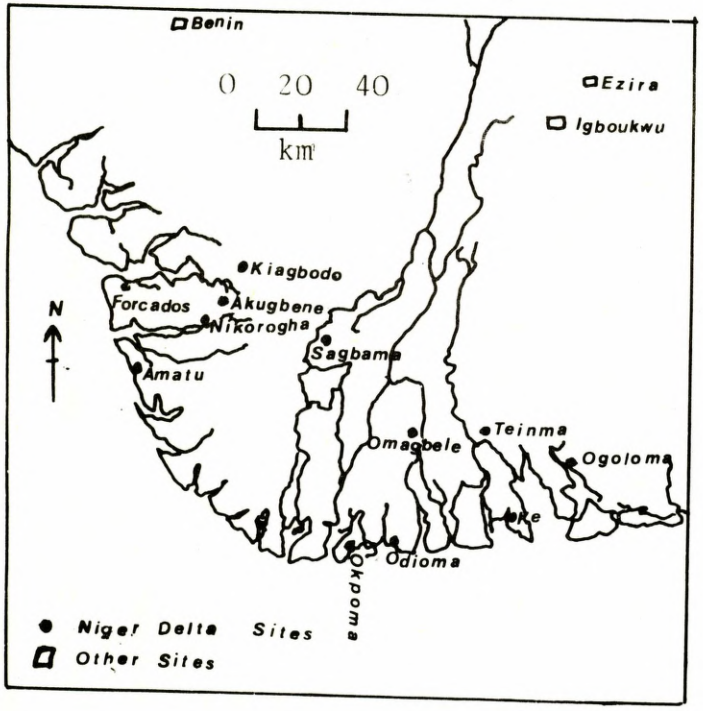
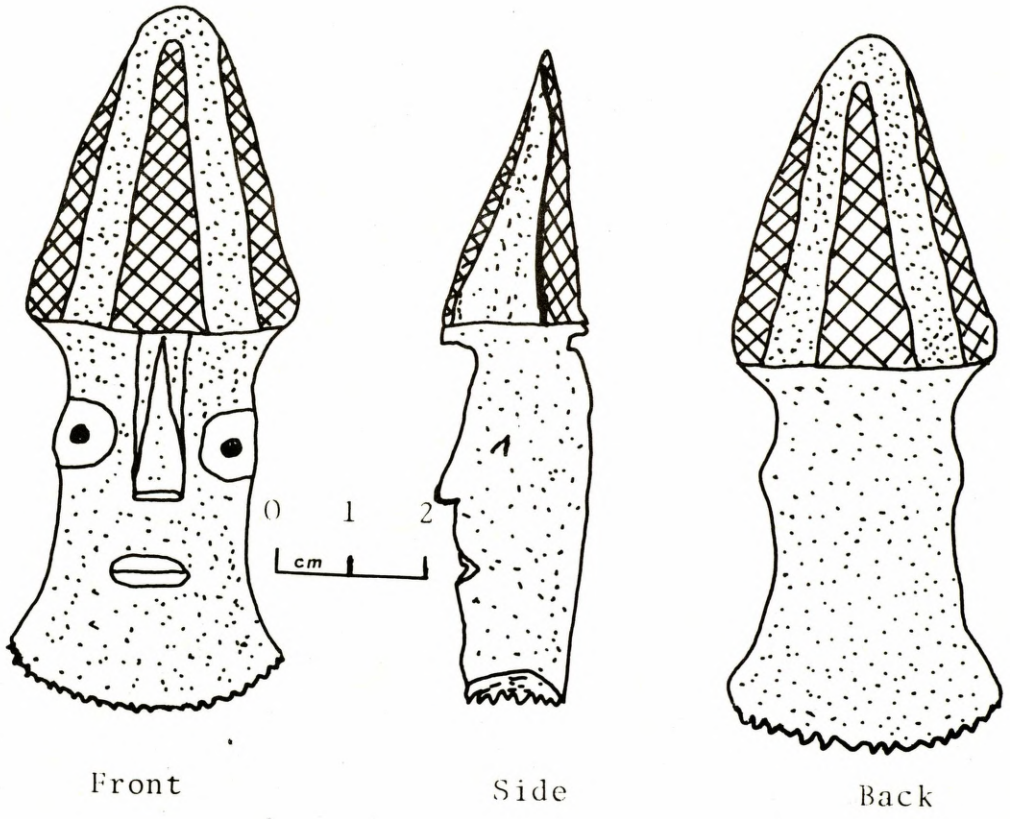



Figure VIII.7 Head Portion of Terracotta Figurine from Onyoma



association with the Oba of Benin who were the source of political power there in the 18th century. This suggests that the east delta was outside the political sphere of Benin. It is also known that in Bonny manilla had political meaning; some rulers commissioned the making of new types of manilla to mark their reigns or important events (Alagoa 1977: pers. comm.; Alagoa and Kombo 1972). Local custom concerning the dead has hindered the investigation of delta graves as such investigation is regarded as violation of valued ancestors. Accidental exposures of graves reveals that as at Onyoma, a coiled pendant-like copper object (iruka) was associated with a burial. The finds in the burial chamber at Igboukwu (Shaw 1970) and at Ifeka (Hartle 1967) are perhaps the most pronounced in this regard.

5. Clay

Objects in baked clay may be grouped under three headings—containers, figurines and smoking pipes. In this chapter only figurines and smoking pipes will be considered as Chapter IX studies the containers.

a) Figurines

The terracotta figurines of the eastern Niger delta are very few and do not require elaborate descriptive and analytical classification. Here the figurines have been tentatively grouped into four broad groups: i) Human figures; ii) Mask-models; iii) Animals and iv) Others (which are pieces which have not been identified) (See Table VIII.3).

i) Human Figures. Only two human figures both from the excavation at the Phase III site of Onyoma are found among the figurines (Fig. VIII.7). Although only the head portions were recovered, one figure (Fig. VIII.7) appears to have broken off from a figure from just above the neck but below the mouth. For the tapering hat a modern parallel was found at Okpoma some 35 km south of Onyoma where the Suo Alabo, priest of the Creator, was observed wearing a prototype of this headgear in raffia during the Idu festival (Alagoa 1974/5; 31). The second of these human figures is said to be an artistic degeneration from the head piece. It lacks the smooth finish and close human representation of the human figures from elsewhere in Nigeria and looks more like dolls.

ii) Mask-Models. Three terracotta heads were recovered from the Phase III site at Ke, one on the surface of a shell midden and the other two by builders digging for earth to make house walls. The three have remarkable resemblances to the Kalabari wooden masks of today. Obvious differences in their structural appearances are those of horn-like projections from the head of one, depressions in the head of another with criss-cross incisions on the cheeks (Figure VIII.8) and yet a third has two pairs of protruberant eyes, sealed lips (Figure VIII.9) very similar to the four-eyed Opongi mask used today at Minama and Buguma.

iii) Animal Figures. The five identifiable creatures from the Phase III site of Ogoloma are made up of two animals and three fish. About 17 other parts are still unrecognised but they include two animal-like figures, three fish-like heads and 12 other fragments of animals and fish.

Table VIII. 3 Terracotta Figurines from the East Niger Delta

| Site | Level | Group: Human | Mask | Animal | Other | Comment |
|---|---|---|---|---|---|---|
| Ogoloma | | | | | | |
| IA | 1-3 | | | | 1 | With split head, two feet and flat base. Not clear. |
| | 12 | | | 2 | | Fish with head and eye indentations but without tail. |
| | | | | 1 | | Tortoise shell without tail, and legs but hollowed in the centre. |
| | 21/22 | | | | 4 | Four pieces of unidentified figurines; possibly separate figures. |
| | 23/24 | | | 2 | | One fish<br>One mammal with whiskers and eye lashes |
| IB | 7 | | | | 1 | Not identified |
| IC | 5/6 | | | | 1 | Not identifiable but of red clay |
| | 7/8 | | | | 7 | Seven pieces, none identifiable |
| ID | 1/2 | | | | 2 | Not identifiable |
| | 10 | | | | | |
| Ke | | | | | | |
| a) | Unknown stratigraphic unit, recovered by builders | | | | 1 | Boat shaped figure |
| | | | | | 1 | Unidentified |
| | | | 2 | | | One with horn-like projections. Depressions at head of another. |
| | | | | | | Third with projecting eyes and sealed lips. |
| b) | Surface | | 1 | | | |
| Onyoma | | | | | | |
| | Surface | 2 | | | | Human heads with hat |
| II | | 1 | | | | Recorded in Anozie's field notes but not seen by me. |

Figure VIII.8 Idented Terracotta Mask Head from Ke

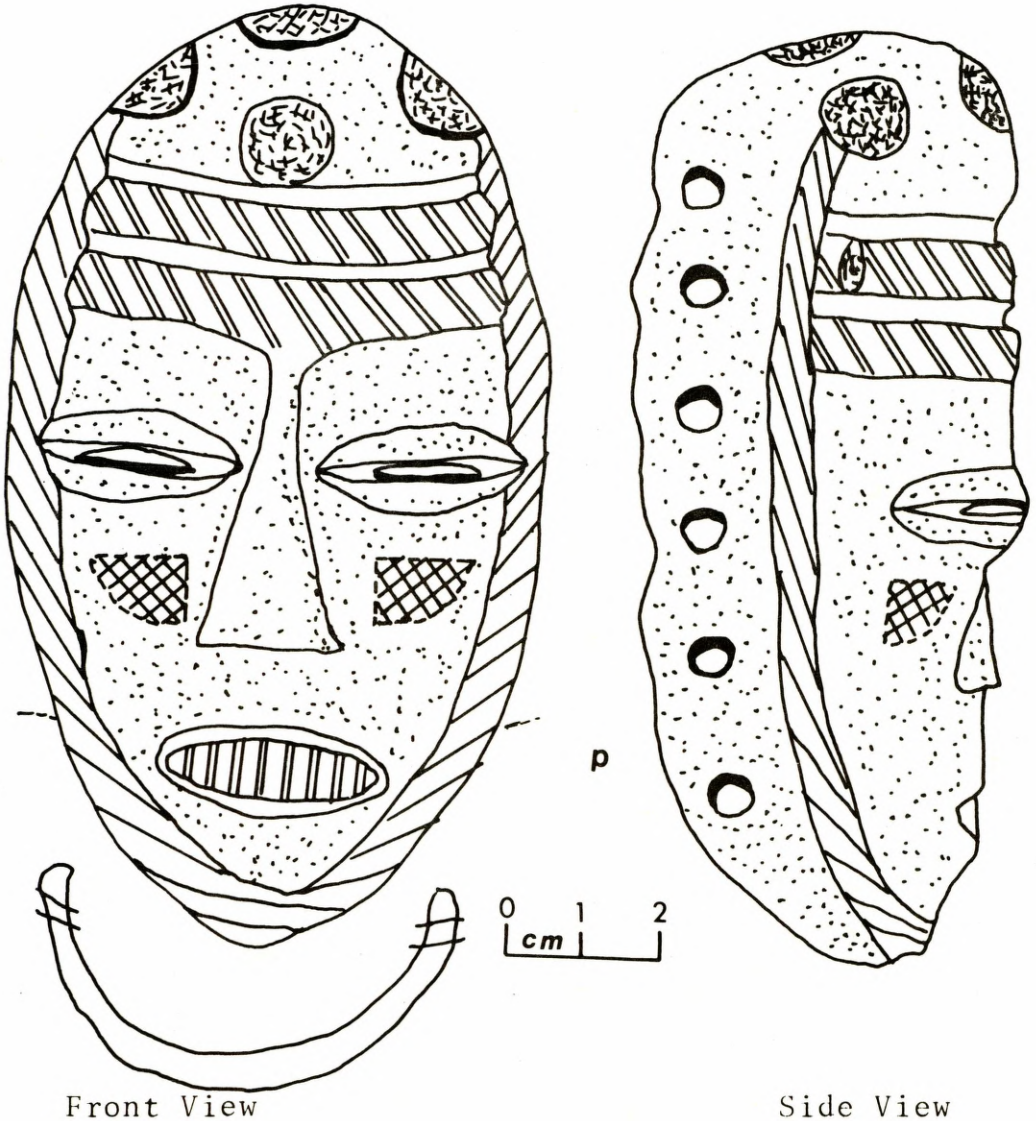
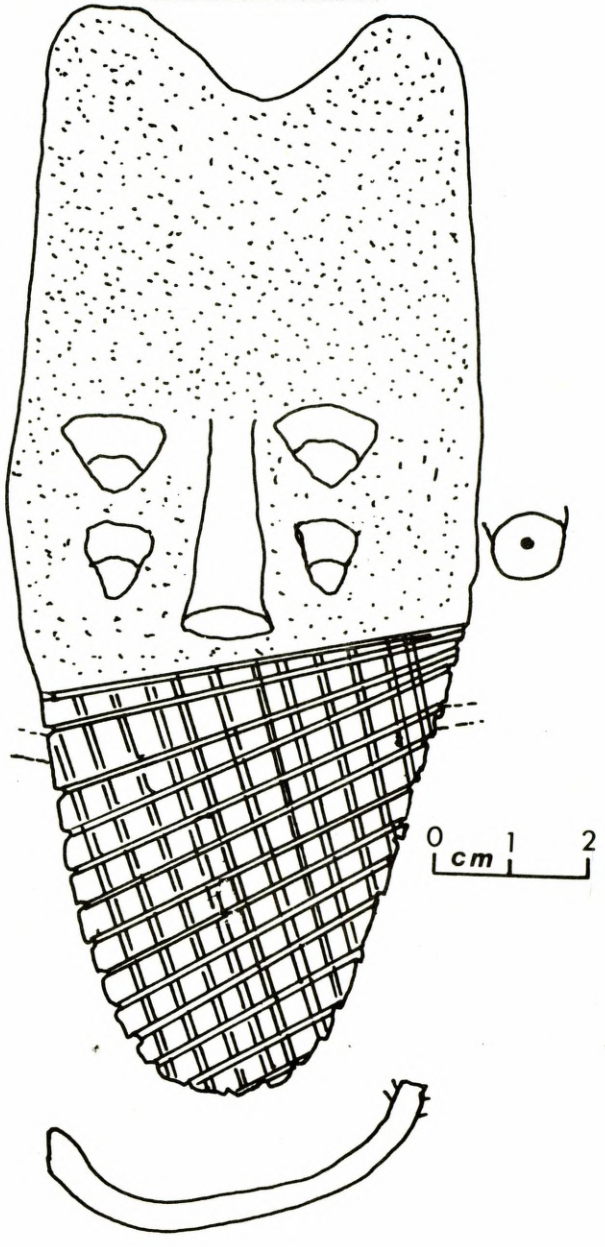



Figure.VIII.9 Four-eyed Terracotta Mask Head from Ke



None of these figures was complete and among the fish there were no tails although the heads had indentations depicting the snout, mouth and the eyes. One of the figures was a replica of a tortoise shell (without tail or legs). Some of these figurines showed signs of wear arising perhaps from handling after the excavations.

In their preliminary reports and interpretations on Niger delta finds, Anozie (1976, 1978) and Alagoa (1976) appear to have taken no notice of these.

b) Interpretation

(i) Anatomy: Among both the human and animal figures there were no physical characteristics or anatomical details that immediately give a clue to the sex or species of the figures, unless of course the identification of the masculine head piece from Onyoma (Figure VIII.7) is accepted. Alagoa, commenting (1974/75) on the morphological characteristics of horn-like projections, a rugged and heavy appearance of one mask-model from Ke (Anozie 1973 Plate on p. 8), thinks it is a male while another from the same site is believed to be female because of a more mellow appearance with its cavities and facial decoration (Fig. VIII.8).

(ii) Context: These objects came from archaeological excavations but observation in the course of fieldwork showed that many terracotta figures are still in private possession. Some were observed in use during the Odumu festival, a kind of water regatta, at Okrika in 1977 and while at Ke, I was shown a full human terracotta in Mr. Bebesoku's private possession. Although the traditional religious houses and shrines are surrounded with secrecy it is believed that some figurines are kept in them.

(iii) Significance and Usage: Ethnographic observation and local information so far collected has not made their place in delta life clear. On information from the western Niger delta, Alagoa (1969) suggests that the mask models were never used except as models for the wooden masks employed in the masquerade dances. The western delta figurines however have a context quite apart from that of the eastern delta, being found only in shrines. What appears likely is that at a certain stage in the masquerade-dance history, terracotta figures were made of them and reserved in shrines for later copying in wood of masks. The purpose here is to maintain some degree of uniformity from year to year in the appearance of the masks especially with the changing generations of ritual carvers. It is equally possible that while the wooden masks remained the public property, the figurines were devoted to the deities with whom they shared the mask theme.

In the eastern delta however the observed trend is for continuity of usage in the masks in the socio-ritual plays. Terracotta figures of fish, animals and birds were used in Okrika in the actual Odumu ritual dance in August 1977. In Ke they are used in the annual water spriit dance. On account of their smallness the figures were worn on the head, on the arm, but most are usually carried in the hand (Bebesoku: in conversation Sept. 1977). It would seem however that in Ke they were restricted to men who played an active role in the dances but who had passed the virile stage of their life. Perhaps these served as badges of office, trophies or certificates of merit.

The human figure with the tall hat from Onyoma (Figure VIII.7) is perhaps a commemorative figure of some wealthy, powerful or highly placed person. The attire which has been ethnographically paralleled at Okpoma gives "the impression that the artist has attempted to depict an important personage" (Alagoa 1974/75: 31).

Terracotta human figures (in the form of effigies) have been used also in secondary burial rites, fengu. The second Onyoma figurine which has been described as "a far cry from the first in the level of technical competence" is perhaps used in fengu where no excellent workmanship is required. It is equally possible that it was used as a doll.

It should be stated that no single interpretation of these figurines can be satisfactory as usage may cut across geo-cultural zones. Clay figures like wood have also been used for children's dolls, for the profane, in curative medicine, in sympathetic magic as well as general fertility and increase ceremonies. Distinction between one and the other is often conjectural (Weekly 1950).

It is interesting too that the figurines show marked thematic differentiation although our present data is limited in quantity. The mask-like heads are at present confined to Ke, while the human figures are from Onyoma and yet the animals and fish representations come from Ogoloma, further northeast of these two areas. They show some degree of abstraction such as Figure VIII. 9; and some reality too (Figure VIII.7).

Although no cross cultural comparative analysis exists for Nigerian figurines, there is some relationship between the east Niger delta figurines and their immediate northern neighbour Owerri Igbo who use Mbari mud sculptures to express their religious, social, historical and ritual view of the world. The dentition modelling of the Ke mask-like heads resemble Old Oyo heads; on criteria of the blocking out of the facial features the four-eyed figure from Ke resembles Nok and Igbo wooden modellings. The eye perforations of the Onyoma figures resemble Nok and Yoruba figures and those of Daima superficially (Alagoa 1974/75).

c) Conclusions

On the evidence of Onyoma, clay figurines have been in use in the eastern delta from at least the 15th century A.D. and belong generally to South Nigeria inland tradition. They do not seem to have been of every day local importance but continue to be used regularly in religious ceremonies.

6. Smoking Pipes

The history of smoking in the Niger delta and indeed in West Africa is incomplete and is restricted to the last 400 years. The earliest study in West Africa was Shaw's (1960) work in Dawu, Ghana. Since that time some smoking pipes have been recovered from other excavations in Ghana: Yendi Dabari (Shinnie and Ozanne 1962). Ladoku (Ozanne 1964), New Buipe (York 1973) and in Nigeria: Kainji Reservoir Area (Breternitz 1975), Niger Delta (Alagoa 1976) and Isoya, Ife (Eluyemi 1975). These smoking pipes divide distinctly into two: imported factory made and locally made smoking pipes. From the east Niger delta 104 complete and partial smoking pipes have been

Table VIII. 4 Distribution of Niger Delta Smoking Pipes

| | Surface | | Excavation | | | |
|---|---|---|---|---|---|---|
| | Local | Imported | Local | Imported | Total | % |
| Ke | 1 | 1 | | | 2 | 1.9 |
| Unyeada | 2 | 1 | | | 2 | 1.9 |
| Okochiri | | 1 | | | 1 | 1.0 |
| Saikiripogu | | | 1 | | 1 | 1.0 |
| Onyoma | 2? | | | | 2 | 1.9 |
| Ogoloma | | 2 | 68 | 26 | 96 | 92.3 |
| Total | 5 | 4 | 69 | 26 | 104 | |
| % | 4.8 | 3.8 | 66.3 | 25 | | 100.0 |

% Surface 8.6; % Imported 28.8
% Excavated 91.3; % Local 71.2

recovered (Table III.4). The present study is an attempt to distinguish east Delta characteristics and relate them to other West African finds.

a) Previous Studies

Studies of clay smoking pipes have made considerable progress in England and America (Oswald 1975, Walker 1973, 1975) and they could be a more useful took in archaeological research in West Africa, especially with regard to recent archaeology (Ozanne 1969, Walker 1975, Calvocoressi 1975). Most methodological references apply to European and American-made clay pipes and it is neither possible to use the analytical model devised by Walker (1975) in the study of local West African pipes as they lack the maker's marks which are critical to Walker's analytical approach, nor the typology, which Oswald (1975) has demonstrated from bowl and stem analysis nor the statistical dating of Binford (1961, Hanson 1971). Equally suspect would be the application of the stem bore diameter formula devised by Binford (1961) and brought into disrepute by Hanson (1971) despite attempts to make it operationally acceptable (Walker 1975). Of late, however, absorption and hardness factors have been employed for distinguishing the regional characteristics of the pipes (Oswald 1975).

In West Africa, Shaw (1960) used the morphological and aesthetic characteristics—bowl, stem, base, decoration and angle while York (1973) went a step further by the application of computer simulation. York's work was largely based on analytical criteria devised by Ozanne (1964).

b) Criteria used in Present Study

In studying the East Niger delta smoking pipes the following general criteria are used after York (1969).

Bowl: a) the direction of flare
b) constricted
c) straight or vertically-walled
d) spherical or bulbous

Collar: if present a) round
b) flat
c) sharp
d) without collar

Angle: a) Angle between bowl and stem from the top
b) occasionally, angle between stem and base

Stem: if present a) projection on other side of pipe
b) size compared to bowl
c) socket end-flared, rounded, necked

Base: if present a) high or low
b) circular
c) flared downwards, flat, elongated
d) segmented or whorled

Decoration: a) position of decoration - bowl, stem, base
b) type of decoration - groove, chevron, geometric
c) plain

c) Classification

The above criteria were never found together in any single smoking pipe not even among the complete pipes. The analysis relied more on a combination of attributes of three major parts of the smoking pipe: the bowl, the stem socket and the base. Decoration was considered a secondary criterion viewed as an attribute of a particular part of the smoking pipe. Since angular and collar affect the general shape of the bowl, the stem and the base, they were regarded as qualities of the parts of the smoking pipe on which they were present.

Fifty smoking pipes from Ogoloma, were used as a sample and divided into five groups (A-E), two of which have more than one sub-group (Fig. VIII.10, Nos. 1-41; Fig. VIII.11).

Group A: Bulbous bowled pipes (Figure 10, Nos. 1-7)

Bulbous bowls, thin-walled, stand at angle 90° or over with thin stem socket. May have spurs (nos. 6 and 7) or be decorated with heavy grooves (Nos. 5 and 6). No complete stem pipes were used for the study although surface finds from Ke show that they measure 8-10 cm in length. These are the only imported European pipes.

Group B: Torpedo shaped pipes (Fig. 10, Nos. 8-10)

These smoking pipes have narrow straight standing bowls which stand without collar on torpedo shaped stem socket complex. These stem sockets usually extend to the side opposite the socket usually all in one piece. They may have pedestals (Nos. 9 and 10) or none (No. 8), all with some form of decoration—banded chevron or grooved discontinuous wavy lines (Nos. 8 and 9). Those with pedestal resemble Fig. 10, Nos. 30 and 31.

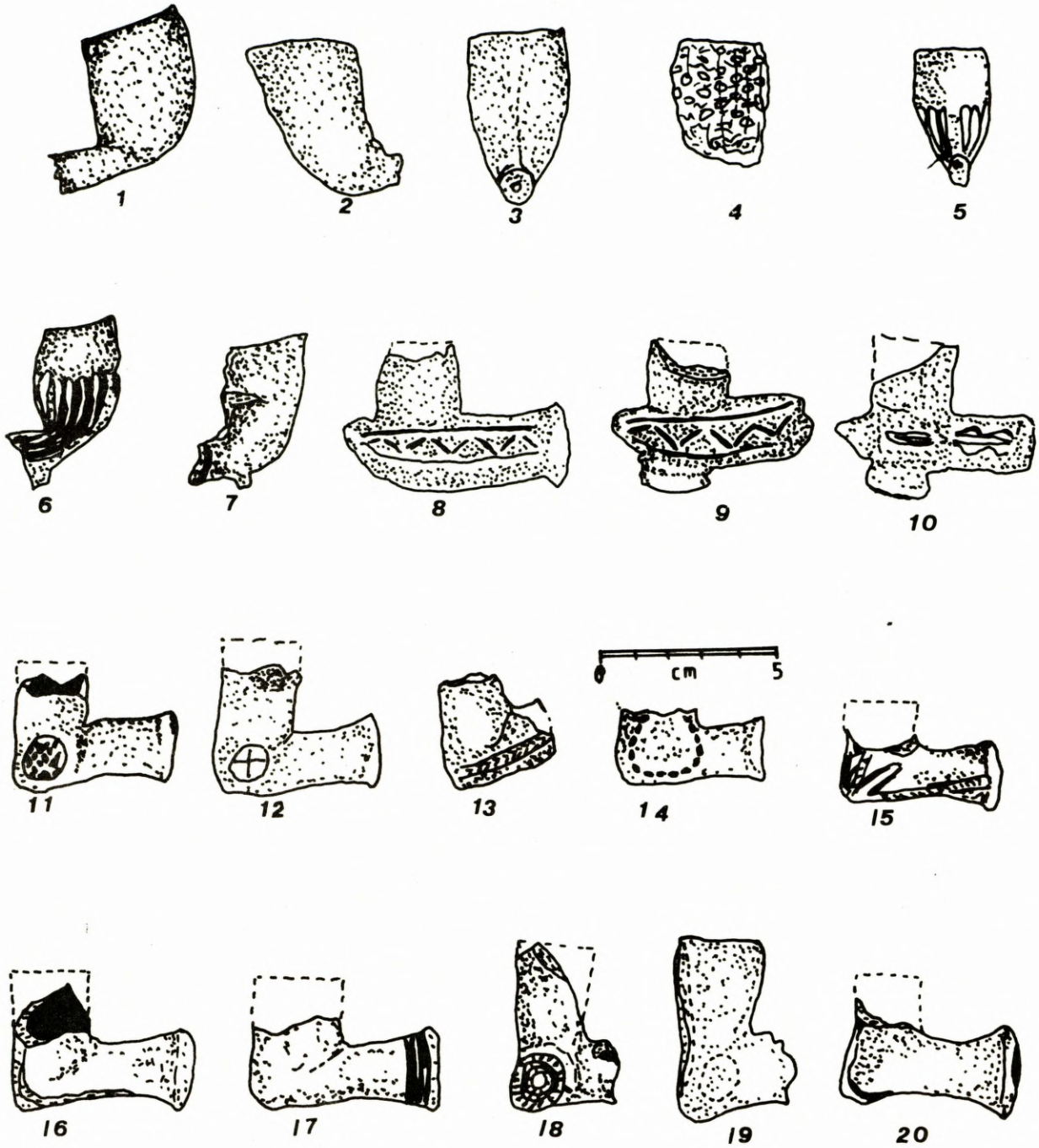
Group C: Straight or Vertically Walled Bowls

These divided into three sub-groups:

Subgroup C1 (Fig. 10, Nos. 11-17). Incomplete bowls but general pattern shows tendency to remain straight, rounding up at the base with a smooth curve which runs to a flare (Nos. 11, 12) or neck (No. 17) at the stem socket. Among the smoking pipes used for analysis 32% were represented in this subgroup. The stem stood at about 90° or little less from the bowl, and was slightly thinner than the bowl in maximum external diameter.

Subgroup C2 (Figure 10, Nos. 18-20). Incomplete bowl (No. 18) with tendency to be straight and long, with slight in-curve towards the base only to out-turn to a rounded base which runs upwards to end in a flared necked stem (No. 20). The complete bowl (No. 19) exhibits similar characteristics to No. 18. When decorated the style is the single circle formed by ring of dots or the series of grooved concentric circles with short light incisions between the circles (No. 18), the decorations situated near extreme end of base.

Subgroup C3 (Figure 10, No. 21). Complete pipe with short bowl and short stem socket both joining at angle of over 90°. The bowl is slightly wider than stem in maximum external diameter and is decorated with diamond-shaped motif. Only one specimen of this subgroup was encountered in the study.




| | | |
|---|---|---|
| Group A | Nos 1-7 | |
| Group B | Nos 8-10 | |
| Group C | Subgroup C1 | 11-17 |
| | Subgroup C2 | 18-20 |

Figure VIII.10 Illustrated Specimens of Smoking Pipes from Ogoloma used in the Classification

Group D: Pipes with Pedestal

Subgroup D1 (Fig. 10, Nos. 22-29). Incomplete bowl but slight sign of flare towards the top. The pedestal is usually broad, well-rounded and may end in a collar to the bowl and stem socket (Nos. 22, 26, 28, 29) or stand collarless (Nos. 25, 27). Although broad the pedestal is narrow when compared with those of sub-groups D2 and D3. The angle between bowl and stem socket is on the average about 75°.

Subgroup D2 (Fig. 10, Nos. 30 and 31). Long, straight and heavy pedestal forming single vertical axis with the bowl of the smoking pipe, collarless. After a curve from the stem socket and the opposite side the pedestal flares downwards into a broad base. The bowls show a general tendency to heaviness equal to that of their stem sockets. Decoration is the banded herring bone (No. 30) or the grooved diamond motif which runs on the stem socket and not on the pedestal (No. 31).

Subgroup D3 (Nos. 32 and 36). These are only pedestal fragments which show general characteristics of pedestals in D2 except that they have handle like attachments. No. 32 is remarkable for its hollow base which has openings cut through it similar to the handles. Their bowl and stem sections are broken off.

Subgroup D4 (Nos. 34 and 35). These pedestals show the same characteristics of D2 as a single piece of the entire smoking pipe, but their pedestals taper into a rounded base. The bowl of No. 34 shows a tendency to being bulbous while a collar is attached to its pedestal.

Subgroup D5 (Nos. 33, 37-39). Segmented or whorled pedestals. These pipes have a tendency to smallness when compared to other pipes, their segments run from two (No. 33) to four (No. 38), usually becoming broader towards the base; some showing external protrusion on the other side of the stem socket (Nos. 37, 38).

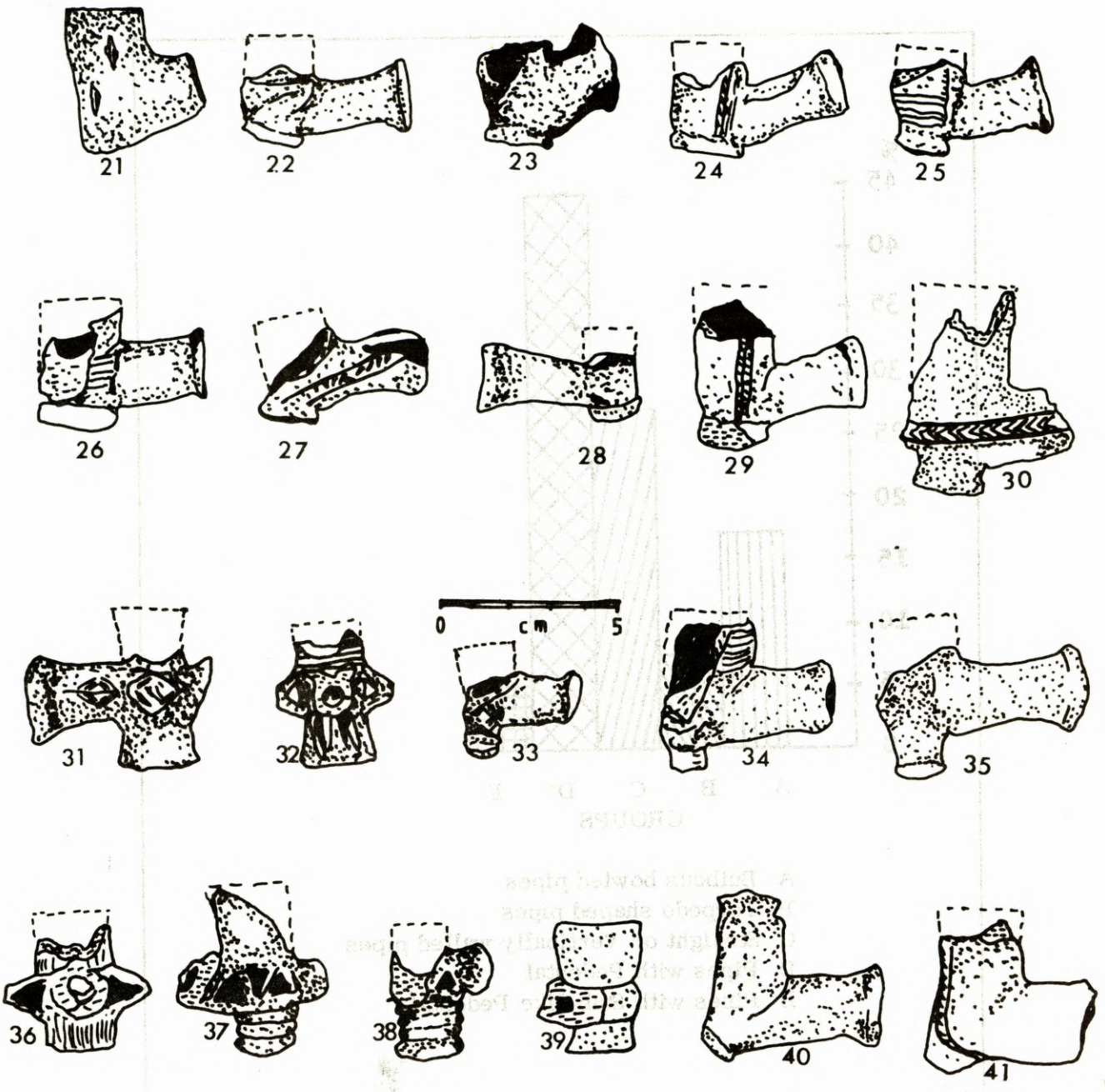
Group E: Stub-like Pedestal (Fig. 10, Nos. 40 and 41)

These protruding bases appear like spurs but away from the stem. As a result they give the smoking pipes an appearance of an outward bend from the stem socket resulting in an angle of more than 100°. No 40 has a collar and both Nos. 40 and 41 show equality in external diameter of bowl and stem.

d) Discussion

The classification gives no clue to their chronological and stratigraphic relationships, although some groups cut across stratigraphic and chronological spectra. The problem is further complicated by the absence of a control sample and number of complete pipes.

The main questions that arise in studying the Niger delta smoking pipes, and especially the Ogoloma ones concern the presence of European factory-made and locally-made smoking pipes and their stratigraphic and chronologic relationship. Table VIII.5 shows the stratigraphic distribution of the smoking pipes from Ogoloma where they can best be studied. The occurrence of local clay smoking pipes in the lower levels of the excavated trenches is of interest for the few European factory-made smoking pipes occur at levels closer to the

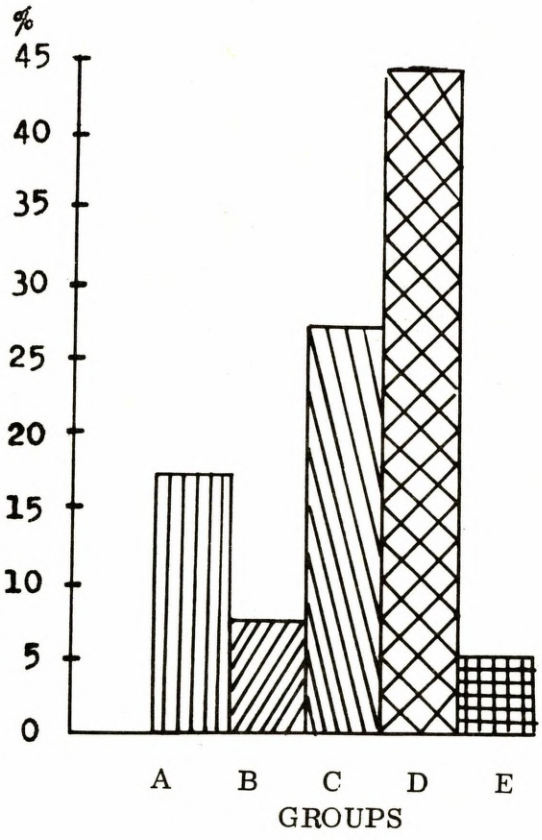



Subgroup C3 No 21

Group D Subgroup D1 Nos 22-29
" D2 Nos 30 and 31
" D3 Nos 32 and 36
" D4 Nos 34 and 35
" D5 Nos 33, 37-39

Group E Nos 40 and 41

Figure VIII.10 continued




A Bulbous bowled pipes
B Torpedo shaped pipes
C Straight or Vertically walled pipes
D Pipes with Pedestal
E Pipes with Stub-like Pedestal

Figure VIII. 11 Percentage Representation of Groups of Smoking Pipes from Ogoloma

Table VIII·5 Stratigraphical Distribution of Smoking Pipes from Ogoloma

| S/NO | Level in cm | IA | IB | IC | ID | DATES A.D. | DATES C14 |
|---|---|---|---|---|---|---|---|
| | | | | | | | B.P. |
| 1 | 0-20 | oo | | | o | | |
| 2 | 20-40 | + | +++ | o | oo | | |
| 3 | 40-60 | | + | | | | |
| 4 | 60-80 | o | +ooo | o | o | 1840 | 110 + |
| 5 | 80-100 | oo | o | +oooooo | +o | | 75 (IB |
| 6 | 100-120 | | | ooo | | | |
| 7 | 120-140 | | o | + | | | |
| 8 | 140-160 | | + | | | | |
| 9 | 160-180 | + | ++ | + | + | | |
| 10 | 180-200 | +++ | | ++ | | | |
| 11 | 200-220 | + | + | | | 1825 | 125 + |
| 12 | 220-240 | +++ | + | | | | 75 (IB |
| 13 | 240-260 | + | ++++++ | +++++ | | | |
| 14 | 260-280 | + | | ++++++ | | | |
| | | | | ++++++ | | | |
| 15 | 280-300 | | +++++ | ++ | | | |
| 16 | 300-320 | | | +++++ | | | |
| 17 | 320-340 | + | ++ | | | c.1500? | |
| 18 | 340-360 | | | | | 1350 | 605 + |
| 19 | 360-380 | | | | | | 100 (IA |
| 20 | 380-400 | | | | | | |
| 21 | 400-420 | | | | | | |
| 22 | 420-440 | | | | | | |
| 23 | 440-460 | | | | | | |
| 24 | 460-480 | | | | | | |

Legend

o = factory-made imported pipe

+ = local clay pipe

surface and are dated to the late 18th and 19th centuries. Of the three radiocarbon dates obtained for this site one places it around the 14th century (605 ± 95 B.P.) and the other two dates are in the first half of the 19th century (110 ± 125, 105 ± 70 B.P.). It is evident that from level 7 of pit IB and level 6 of pit IC the European smoking pipes occur side by side with the locally made pipes. After level 5 of pits ID and IC the locally made pipes do not occur again towards the surface. But because the two later dates come from the same pit (IB) and not from pit IA where the earliest date was obtained it has not been possible to confirm their chronological status with the radiocarbon dates alone. To throw more light on this study it became necessary to refer to the site inventory. In this regard in the analysis of the pottery remains (see Chapter IX) a good number of imported factory made ceramic fragments was recorded from different levels in the four pits (Table V.1). However the shape of the midden, its method of accumulation and the relationship of one pit to another must be studied before final results can be presented. The available evidence indicates that locally-made smoking pipes were popular for a long period before the imported factory-made smoking pipes so far found in the eastern Niger delta. Since they do not copy European types the inspiration for them must be sought elsewhere.

The other important issue that requires consideration is the relationship of the Niger delta locally made clay smoking pipes to those found in the wider West African region. The smoking pipes from the Niger delta show close affinity with those from Ghana and the Kainji Reservoir Area in their tendency towards heavy, thick-walled bowls and stem sockets and short stems and sockets designed for the insertion of a secondary and longer pipe stem. Their external morphological appearance differs especially as the New Buipe smoking pipes (York 1973) have well pronounded collars, a few of which show up at Dawu, (Shaw 1960) and at the Kainji Area (Breternitz 1975) but are generally absent in the Niger delta. While these pipes also show a tendency towards bulbous bowls the Niger delta pipes show marked tendency towards straight walled if also slightly flared bowls. The structure of the base of the Niger delta pipes is remarkably distinct from the other West African collections. In terms of their chronological placement, the statistical and radiocarbon dated New Buipe pipes, the radiocarbon dated Kainji sites, and the associationally dated Dawu, and Benin pipes (Connah 1975) seem to belong to the 16th or post 16th century. The Niger delta pipes seem to represent a different tradition and are said to resemble 'native' pipes of the Americas and the rather separate-stemmed pipes of Europe and therefore might have been due to either direct import from 16-17th century America or to the German 17-19th century tradition in Europe (pers. comm. Alexander 1978).

In considering issues of social habit such as smoking it has been conventional to look beyond the data and its geocultural sphere of occurrence. This has led to explanations that rest on diffusion models. Shaw (1960) in a classic assessment of relevant literature on the early history of smoking and tobacco pipes has shown that not only is there confusion in this literature but a lack of coherence on the development of this phenomenon across the globe if we assume a common source for it. In short, Shaw's "Who copied from whom?" (1960: 279) remains largely unanswered especially when the presence of smoking pipes as we now have in the Niger delta is brought into the scene. In

fact Shaw's diffusion routes (Shaw 1960, Fig. 11, p. 305) tend to support this opinion. Shaw's diffusion route from America to England in 1565 seems to have been supplanted by the type of the 1586 diffusion route which is the characteristic smoking pipe with thin-walled bulbous bowl and long thin stem. The 1565 type does not seem to have been used in Europe but only in West Africa from where it is thought to have moved overland even into Spain. This no doubt creates a missing link in the chain. Perhaps the issue could be resolved to some extent if the antiquity of smoking in West Africa was separate from the antiquity of smoking and tobacco. Ozanne (1969) and others (Wulsin 1931, Lebeuf 1962) have suggested "a possibility that some leaves (weeds) unknown to us were smoked before the introduction of tobacco" (Eluyemi 1975: 108) but there is as yet no dated evidence earlier than the 16th century.

e) Conclusions

The pipes of the East Niger Delta, coming as they do largely from one site, cannot be used as more than a biased sample. They do however suggest that the native styles were different and probably older than the 18th and 19th century European types which are the only popular ones so far recognised. The native styles are part of a coastal West African grouping which may owe its origins to direct import from the Americas in the 16th century. It is interesting that no European styles before the 18th century seem to have influenced the pipes at Ogoloma.

# CHAPTER IX

# CERAMIC CONTAINERS

This aspect of material culture has been separated from the others and given especially detailed treatment because at the present it is the most numerous class of object surviving in the delta and so has the greatest potential for providing new evidence. Central to the study has been the material from the five sites examined by the author in the 1976-77 seasons but these must be seen against the wider Nigerian evidence.

## INTRODUCTION

Pottery containers are today used by every community in the delta. In the last century they have been provided partly by family manufacture within settlements and partly by exchange/purchase from a series of specialist potters disposing of their wares through local markets.

To discern the significance of the pottery remains requires an understanding of the entire pottery industry and its distribution mechanism. Among data relevant to this line of interpretation are the recent centres of traditional manufacture, the source and type of clay used, the particular classes of pots they made and the level of specialization involved. Related to this are questions of where a site obtained its pottery materials, whether these were the product of one producer or a set of producers from one area using common or different sources of clay; the techniques of manufactures—fabric, temper, firing methods, trade marks in the nature of decoration—persistent motifs, types of decoration and position of decoration and how these are related to the different classes of vessel. Linked with these is the distribution mechanism. It must then be considered whether the pottery obtained from the excavations was made and distributed in the same way. It can be appreciated therefore that this is a full study by itself.

### 1. Ethnographic Evidence

Potting is an exclusive art of the women in southern Nigeria and although it is practised in various parts of inland eastern Nigeria, it is especially well developed in parts of the Anambra Valley in the west, in the Nsukka area and southwards to the coast (See Figure IX.117 for the distribution of important potting centres in eastern Nigeria). Ceramic wares are known to consumers by the name of their producers for instance in Igboland pots known as Ite Agbaja are made by the potters of Agbaja. Pots are produced for domestic and religious purposes. They do not seem to travel more than twenty-kilometres as most of the movement is by head porterage although the use of middelmen and localized retailers increases the distance covered. In reiverine delta canoe transport may cover over 100 kms.

The manufacture of pots is as a rule in the hands of women and although the art may be the privilege of all in areas where the right type of clay is available, the craft is invariably restricted to a few families. The vessels are usually built up by the addition of successive small pieces or strips of clay (For a description of a present day potting practice, see Willett and Connah, 1969; Anenechukwu 1976). In all cases, hand-forming is the main method in which the potter uses her hands to translate her own ideas on the clay. All the tools are home made and may be improvised from wood, bone, stone and metals.

Decorations are applied before the hardening and invariably before firing. Firing is carried out in open bonfires after the drying stage. In most cases porosity is reduced by oiling the pot. This process takes one of two forms. In the first, palm oil is simply boiled in the pot. In the second, palm nut fibre remaining from the extraction of the oil is heated in the pot thereby transferring the fatty substance to the vessel (Talbot 1926). Even when the vessels are purchased, the user still subjects them to considerable lengths of firing usually over smoking fires before use. In fact this treatment is given to water pots at periodic intervals in their life cycle to prevent leaking and breaking resulting from absorbing too much water. One example may be given of how trading takes place. Today the village of Ogu accounts in large part for the pottery containers found at Okochiri and Ogoloma. But because oral tradition has it that Okochiri is an older site than Ogu it should be expected that the early pottery at Okochiri may have originated from other sources. The variety and beauty of the Ogoloma ceramic materials although chronologically later than Okochiri may equally be the product of more than one potting centre. The closeness of the Ogoni potting centres of Lugbara, Kwawa, Buan and Kono to Ogoloma and Okochiri may also account for the variety of the pottery found at these centres.

Apart from the notes of Jeffreys (1947) in Ogoni and my field notes on Ogu in 1976-77, there is hardly any available material on these potting centres. Little is known of the geology of these centres and the nature of their clays and of the fabric.

The known traditional centres of potting still in operation in the eastern Niger delta are shown in Figure IX.118. There seems to have been a strong industrial influence through imports, across the central delta from the Itshekiri area into the eastern delta (Leith-Ross 1970: 178, Alagoa pers. comm. 1978). Oral information (pers. observ. 1977) confirms this at Ke, Saikiripogu and Nembe although there was a local pottery industry at Saikiripogu where a local clay pit exists (Alagoa: pers. comm. 1978) and at Ke where the Okpor or Abaji Lelema practised potting and also at Onyoma where the excavated pottery classes showed marked difference from other centres especially in the nature of the miniature pots. The preponderance of moulds at Saikiripogu and Ke and their absence from other sites marks them out from others. But no clay pits have been documented for this area.

Along the banks of the Orashi river there are good sources of clay which the inhabitants of Ubimini, Egbeda and Oboburu further north in the freshwater delta utilized until recently. The Oboburu industry must have been restricted to a riverine distribution pattern while, by their location on the mainland,

Ubimini and Egbeda could easily use the Orashi river as a distribution artery to the salt-water sites of Onyoma and possibly Saikiripogu. If they went overland the products of Ubimini and Egbede might likely have reached the eastern sites of Ogoloma and Okochiri and possibly south to Ke. Because of the close proximity of the Ilelema industry to Ke it should be expected that Ke would readily obtain Ilelema pots. However Talbot (1926) who made extensive ethnographical studies in southern Nigeria refers to ceramic works in different parts of the Niger delta although no mention is made of the actual centre in question nor are his descriptions precise enough to use here. But these are a good guide and perhaps help to widen our knowledge in an area where little is known. Among the Igbo sub-tribes with which Talbot (1926: 934) classifies Okrika, "the jars and bowls are of graceful shape often many mouthed and elaborately ornamented" (1926: 934). He notes particularly that no pots made in the other areas ressemble, "the extremely interesting Okrikan pots, which represent the ancestors and on which are modelled in full relief the lineaments of the particular individual whose symbol it is..." (1926:935). The Kalabari who live further southwest of Okrika also "make enormous pots ...with great skill, covered with the most interesting ornamentation" and further north of the Kalabari and Ikwerre are said to be "very dextrous in ornamenting...with geometrical patterns cut out of soft clay" (1926:935).

It is clear therefore that although there seems to have been a good degree of ceramic material coming into the eastern delta from outside the internal traditions appear also to have shown some marked divergences. The extent of their specialisation and the influence of one over the other or the exact volume and lines of movement of recent ceramic material into, within and across the eastern Niger delta can only be appreciated with further research in the ethnography of potting in and around the area.

In approaching the archaeological evidence it is reasonable to use the following assumptions based on the ethnographic evidence:

a) that pottery has probably been used in the delta for a very long time since it is found in neighbouring zones from the 1st millennium B.C. onwards,

b) that initial influences are likely to have come to the delta from the interior but unlike metal objects, there is no reason to see only but a small proportion of the pottery found as imported. Suitable potting clays are widespread, potting methods even today are simple and styles are localized.

## 2. Ceramic Analysis

### a) Aim and Method of the Analysis

The aim of this study of the ceramic containers is threefold: 1) to isolate pottery characteristics within a site, 2) to monitor interrelations existing between sites and hence 3) outside influences on different zones. Because radiocarbon dates were obtained for each of the sites considered here, pottery studies have not been directed towards establishing time scales.

As this is the first study of pottery containers from archaeological sites in the eastern Niger delta the classification has been made as broad as possible with the objective that it will accommodate future research. As a result only simple descriptive methods are employed. Resources at the disposal of the

researcher were, however, inadequate to attempt sophisticated statistical and computer analysis (Spaulding 1971, Cowgill 1971, Shepard 1976, Clarke 1962).

(i) Sample

Of the 13,306 potsherds examined during the analysis 10,633 were used for this study. They were distributed in this order: Onyoma 151; Okochiri 2,173; Ogoloma 2, 591; Ke 2, 746; and Saikiripogu 2,970. Originally 2, 655 sherds were examined from the Onyoma excavations but only 151 have been used for this analysis because the others have been so badly mixed up in transit that they needed resorting, re-numbering and recataloguing. Although this had been done before this analysis was concluded, it was found necessary to restrict their use until their stratigraphic status had been verified. As a result only the general descriptive and qualitative details of those potsherds were used. The 151 sherds used for detailed close study represent sherds from the two shell middens and the different stratigraphic units of the excavations. Although used with caution, the results from them are not different from the general study of forms and decorations from the site.

(ii) Method

The sherds were studied in two ways: 1) they were individually examined physically. Their characteristics were noted on specially designed analysis forms. 2) the sherds from each level were mixed up at the end of the individual sherd study, then resorted again to ensure that there was some degree of uniformity in the standards used. From this second stage some sherds were reconsidered and reassigned. The tabulation method was also aided by notes on the different characteristics of the sherds. The notes also amplified some of the entries in the tabulation. On advice from Professor David only sherds over 5 square centimetres in surface area were used (Professor N. David, pers. comm. 1976).

Although the pottery exhibits a variety of attributes, in isolation, others in combination, this study concentrated on seven sets of attributes, each with its own subsets:

1) Rim and Neck Profile
2) Decoration
3) Fabric
4) Temper
5) Colour
6) Mean Thickness
7) Rim and Body Diameter

These major attributes and their sub-sets tabulated on the pottery analysis forms have been elaborated below. This method was found useful especially for analyzing the materials from Okochiri which had been numbered and catalogued serially from level to level and from pit to pit. It was possible therefore to document each sherd with its pit, level and serial number so that it could be recalled and cross-checked in future. It was not possible to be exact in all cases in the documentation of the other sites where numbering and cataloguing had been different. However, the overall advantage of the scheme is that changes within levels and between levels in a pit could be monitored more

readily. With the data on the forms it has been possible to sum up the quantity of sherds within each attribute unit.

Here the analysis is presented in the following order: 1) the classification based on shape, 2) decorations, 3) fabric, 4) temper, 5) colour, 6) thickness and 7) a general discussion of the pottery from the eastern Niger delta in the context of the site interrelations. The specimens used for illustration are described and referred to within the text although a general reference to their provenance is found in Table IX.4. Since the preliminary classification was carried out between April and September 1977 it has been reviewed twice. The reviews have brought about the recognition of sub-classes within the major classes of rim and neck profiles. Statistical and graphic representations therefore refer to the major classes and not to their sub-classes. However the other major attributes have remained unchanged.

b) Classification and Definition

The words 'vessels', 'pot', 'bowl', and 'jar' have been loosely used in each case mainly because the words in the strict sense have functional implications. These groups of pottery terms have no functional significance in the eastern Niger delta as indeed many parts of southern Nigeria (Connah 1975, Leith Ross 1970) where one class of pottery may be used for different purposes. Wherever these words are used in the text they have been appropriately qualified and illustrated to make them meaningful within the context.

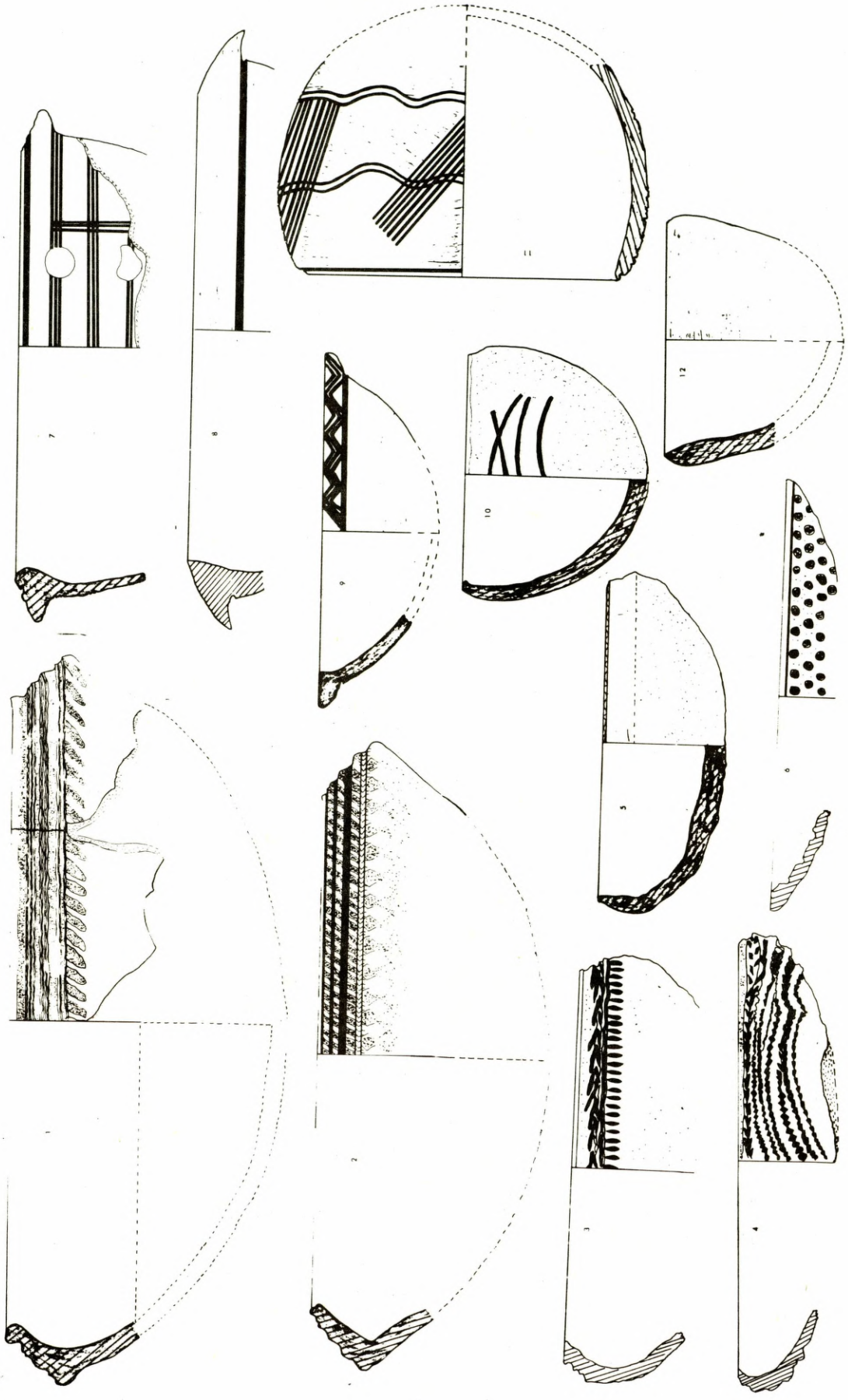
Very few whole pots had been recovered from the excavations. It has therefore been difficult to use absolute ratios of the height to rim and body diameter in determining the overall pot shape and hence the class of pottery. The shape of the vessel and its size has been used in determining to what class it should belong. But because whole pots were few, rim and neck pieces have been used as an indicator of shape. There is no absolute certainty that these must have been true in all cases but the study had been aided by the knowledge of modern parallels in determining the major classes and their sub-classes. Attributes of decoration were not considered as essential to the basic definition of the pot but merely as added for aesthetic purposes. They have not therefore been used for assigning class to a pot. A class as used here defines pots of the same general form and possibly usable for the same purpose. A continuous numbering of the sherds has been used for easy reference. (Table IX.3 presents the distribution of the classes between 11 * sites).

The Classes

Class 1 Large wide-mouthed carinated hemispherical bowls

This class has thick walls, body diameters of up to 40 cm and min. diameter of up to 36 cm. A carination occurs at the point of the greatest diameter from which a pronounced inversion, created by ridged folds and depressions, occurs. These end in a semi-rounded and semi-inbevelled rim. These bowls are known mainly from Onyoma (Fig. IX.1) and Saikiripogu (Fig. IX.2). They are usually decorated above and just below the point of carination. The decorations consist of thin banded horizontal incisions

* (Table IX.3 presents the distribution of the classes between 11 sites)



which enclose dragged light wavy horizontal lines as in Fig. IX.1. They may also be deep wide grooves at the points of depression as in Fig. IX.2. Decorations below the point of carination consist of half capsule-shaped or diamond-shaped structures arranged in rows round the pot.

Class 2 Small shallow wide-mouthed bowls

This class also has thick walls, some of the bowls having rim diameters equal to some in Class 1. Where present, their ridged folds and depressions are less pronounced and usually lead to an inverted flat rim for instance Fig. IX.3. Decorations are of a leaf-shaped incised design which are strung horizontally on a tendrill-like incised line just above the point of inversion. Below this is a row of similar though better designed leaf-shaped designs which hang vertically from a tendrill-like incision. A single horizontal incision may also be positioned near the top.

A variant of this class is Fig. IX.4 which has varied body wall sizes and decorations (broadcast over the body) of stringed lozenges, capsules. This class is known from Ogoloma. With a rough gritty surface if also with heavier wall is Fig. IX.5 in which the point of intersection assumes a carinated shape.

The extreme form of this class is saucer-shaped with a flat rim. This is best known from Ogoloma (Fig. IX.6) where it is well-decorated just below the thin grooved line near the rim with deep impressions, perhaps with a sea shell, broadcast over the outside of the entire body.

Class 3 Large flange-rimmed bowls

This class of bowls has a wide mouth, an external flange at the rim inclined downwards at an acute angle (e.g. Fig. IX.7) or further extended from a broad rim downwards to a bevel which gives a beak-shape when viewed in section (Fig. IX.8). Decoration is confined to single grooves at the point where the rim is everted (Fig. IX.8) or a combination of broad grooves at the top and on the body a series of narrower grooves criss-crossing at an angle of $90^{o}$ (Fig. IX.7). Bosses are also attached at intervals over the horizontal grooves.

Class 4 Small shallow flange-rimmed bowls

This class is similar to class 3 in terms of the flanged rim. It has an everted rim thickened at the lower part but flat at the top. It was especially common at Okochiri. This class is decorated with grooved horizontal lines which appear to be combing or shell edge impressing (Fig. IX.9).

Class 5 Small hemispherical bowls

This class has a simple inverted rim and is close to the cups and crucibles as well as the dish-bowls. Their rim diameters range between 12 cm and 16 cm. The fabrics vary widely. The specimens from Saikiripogu and Onyoma are rough, gritty and thick-walled (Fig. IX.10) while those from Okochiri are smooth textured, thin-walled and flat-rimmed with a broad throat created by a deep groove as in Fig. IX.11. Other examples may be deeper, thick-walled and smooth-bodied as in Fig. IX.12.

Class 6 Heavy thick-walled wide-mouthed bowls

This flat-rimmed bowl probably had a flat base although none were found known from Okochiri. It is roughly made and undecorated and its rim diameter measures up to 20 cm. (Fig. IX.13).

Class 7 Very small bowls

In general this class resembles class 2—the small shallow wide-mouthed bowls (Figs. IX.3-5) except that they are minute and have a rim diameter of under 10 cm. (Fig. IX.14-16). Fig. IX.16 is unique for its size and the peculiar interior flange but may be compared with similar mini pots from Onyoma. Decorations are incised banded X-wise lines on Fig. IX.14 from Onyoma or the dragged (combed) mini-lozenges arranged along similarly dragged short oblique lines (Fig. IX.15). Moreover Fig. IX.15 resembles the baggy cup (Fig. IX.70) although the latter has no decoration. If these were dish-bowls as they have been classified here, it is likely they were used for serving children; or for drinking or as tamunobele ritual pots for which they are known at Onyoma (see Anozie 1973).

Class 8 Large wide-mouthed shallow dishes

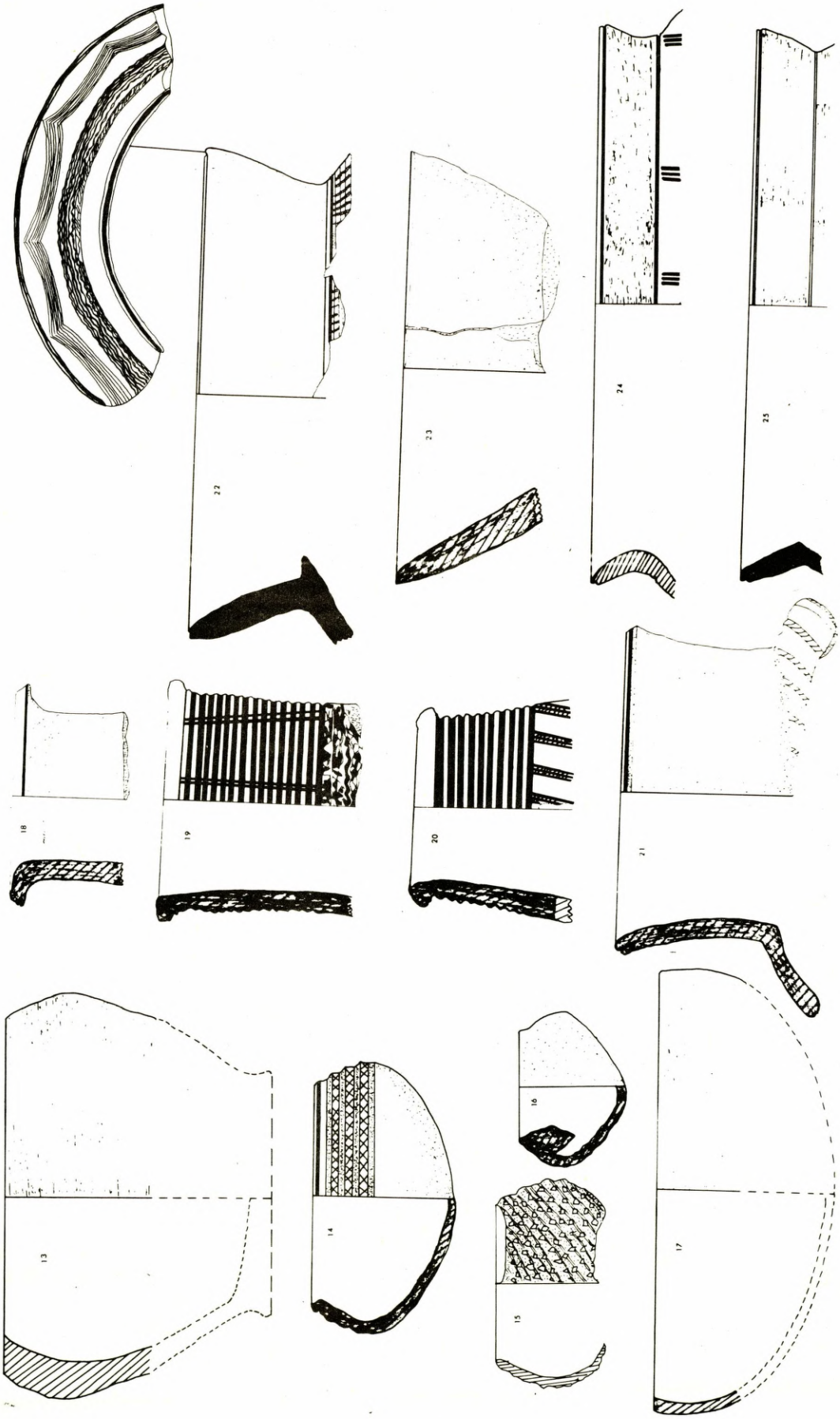
This class of large hemispherical wide-mouthed shallow dishes has near-straight sides towards the rim. The specimen from Okochiri (Fig. IX.17) has thin walls and no decoration and also resembles the inverted rimmed, thicker walled bowl from Onyoma (Fig. IX.5).

Class 9 Long narrow-necked jars

This class of pots has long, almost straight-sided necks with simple out-turned flat and thickened rim. This class appears to be the most elaborately treated among those found. They appear to have been red-slipped after firing and their decorations are concentric deep grooves on the neck. No complete example was recovered by excavation. This class is known mainly from Ke and also from Ogoloma. The variant from Ogoloma (Fig. IX.18) is decorated with a single thin groove close to the rim. Fig. IX.19 from Ke has a tendency to a slight flare towards the top resulting to a subdued stud-eversion of a flat thickened rim. A long neck, which narrows towards the rim before a slight flare which bevels outwards, is also known from Ke (Fig. IX.20). The specimens from Ke may have a series of double grooved vertical lines running close together over the concentric grooves at about 3 cm intervals with unidentified combed decorations towards the base of the neck (Fig. IX.19) or may have a series of double bands created by three grooved clockwise oblique lines originating from the lowest of the concentric lines. Short incisions run through the bands at regular intervals (Fig. IX.20).

Class 10 Large, long wide-necked jars

This class of pots has straight necks which may flare slightly towards a thin rim. The mouth is generally wide giving a neck height to rim diameter ratio of 1:2. This class is known from Ogoloma. The decoration is a single grooved line near the top while just below the point of inflexion at the lowest part of the neck there are oblique bands of short thick incisions which are spaced over the body at intervals of no less than 6 cm one from the other (Fig. IX.21).



Class 11 Large, wide-mouthed funnel-necked jars

This class shows a constriction from where a wide funnel-like neck gently flares out into a flat rim. The decorated specimen (Fig. IX.22) is from the surface at Ke while the plain variant (Fig. IX.23) is from Onyoma. Generally they are thick walled. On Fig. IX.22 the decoration on the upper rim surface (see the relief) consists of thin combed lines which are straight and arched, or arranged rows forming a continuous chevron pattern or simple wavy pattern or even a broad but shallow band. Just below the neck there are continuous horizontal incisions over which minute bead-like impressions give the appearance of strings of beads over the body.

Class 12 Large, wide-mouthed, very short necked vessels

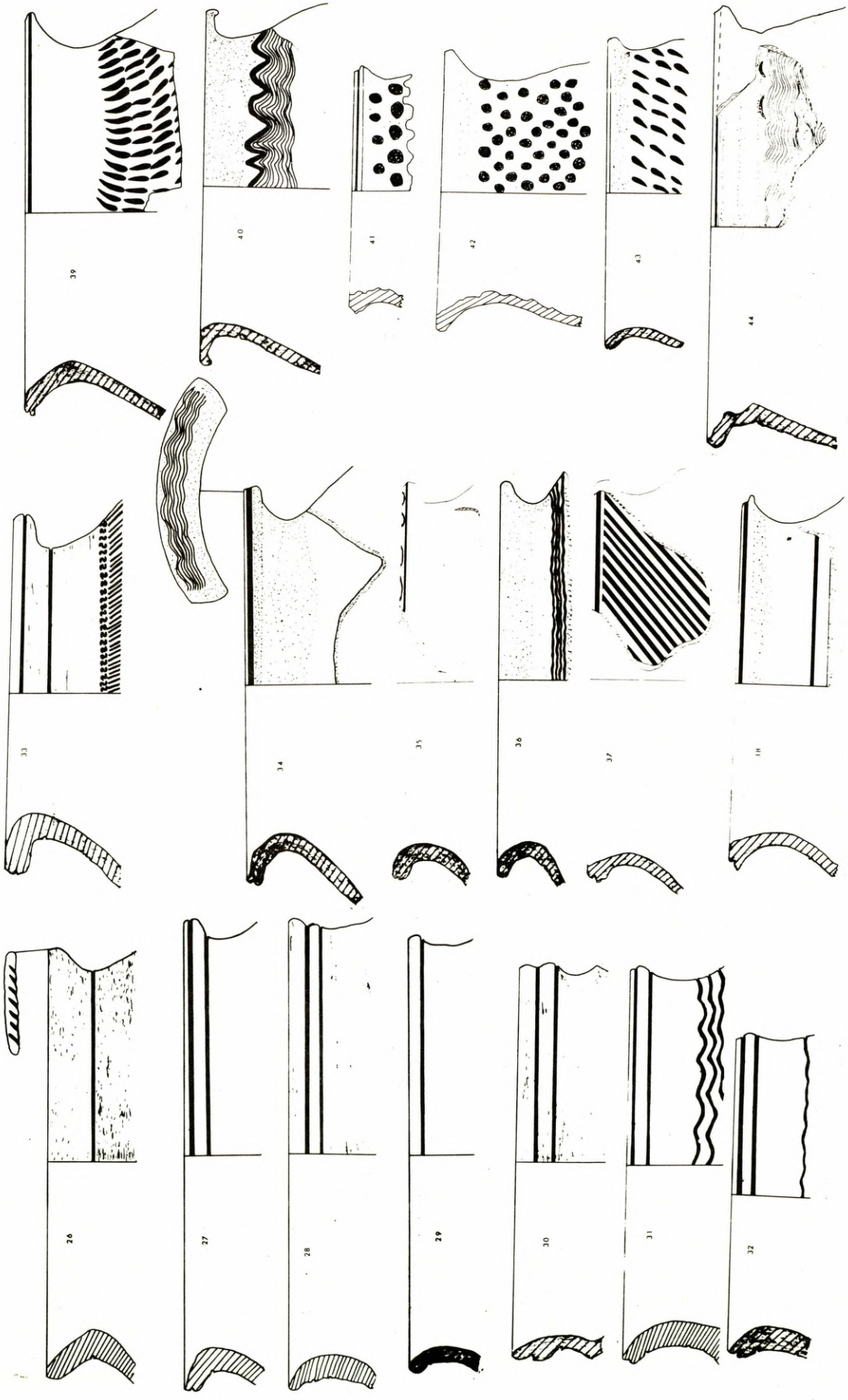
This class of large, wide-mouthed short-necked pots flares slightly into an inversion marked by a deep narrow groove or incision. From here a subdued flare may occur and end in a reinversion which like the flare is heavily subdued. This class which is known from Okochiri (Figs. IX.24-26) resembles the large, wide-mouthed funnel-shaped necked pots from Onyoma and Ke (Figs. IX.22 and 23) but for the difference in the neck heights and angle of flare. They are also thick walled. Decoration is simple being restricted to grooved or incised horizontal lines although occasionally additional series of three short vertical grooves just below the neck is arranged round the pot as in Fig. IX.24. Decoration on the upper surface of the rim consists of impressed finger nail or similar sea-shell impressions (Fig. IX.26).

Class 13 Grooved short-necked vessels

This class of short-necked pots is identifiable by the ridges and grooves towards the top. The necks all start up with a flare but end in inverted or reinverted flat rims. They may be grouped according to their rim diameter or according to their neck profile. In the former they may range from 25 cm for the largest through 20 cm for the medium sized down to 16 cm for the smallest. This class is known from Okochiri. The sizes and forms as noted above show slight variations. The walls may be thin or thick while the flares and inversions may be single as in Fig. IX.29 or compound as in Figs. IX.27, 28, 30-32. Decorations are mainly grooved lines at points of intersection on the neck thus making the ridges prominent. Wavy lines are also known towards the base of the neck as in Figs. IX.31 and 32.

Class 14 Short-necked large globular vessels

These pots have a constricted short neck which flares into a gently rolled, everted, thickened rim. The upper surface of the rim is usually broad and flat. Variations follow the flare and rim structure. The rim may be well rounded and thickened underneath (Fig. IX.33), simply well rounded (Figs. IX.34-36), thin but rolled over (Fig. IX.40) or out-turned, sharply reinverted to a thickened top (Figs. IX.37-39). Decorations are in the form of grooves which may be horizontal (Figs. IX.33, 38) and diagonal (Fig. IX.37); may be combed horizontal wavy lines on the body (Figs. IX.36, 40) or on the upper surface of the rim (Fig. IX.34). Other decorations include the impressed capsule designs on the body, and the applied bosses on the rim surface of Fig. IX.35.



Class 15 Small, shouldered jars

This class is near straight sided, thin walled and has a slight flared rim which shows a rounded inversion or reinversion running down. The rim diameter ranges from 12 cm to 18 cm and shows a tendency to equal the greatest body diameter. The class is known from Ogoloma where the decoration is confined to impressions of deep irregular circles from the upper reaches of the shoulder (Fig. IX.41) to the body from the upper point of eversion (Fig. IX.42). The droplet shaped motif may also be broadcast over the body from the point of flare (Fig. IX.43). The decorations appear to have been stamped with sea shells.

Class 16 Medium sized shouldered jars

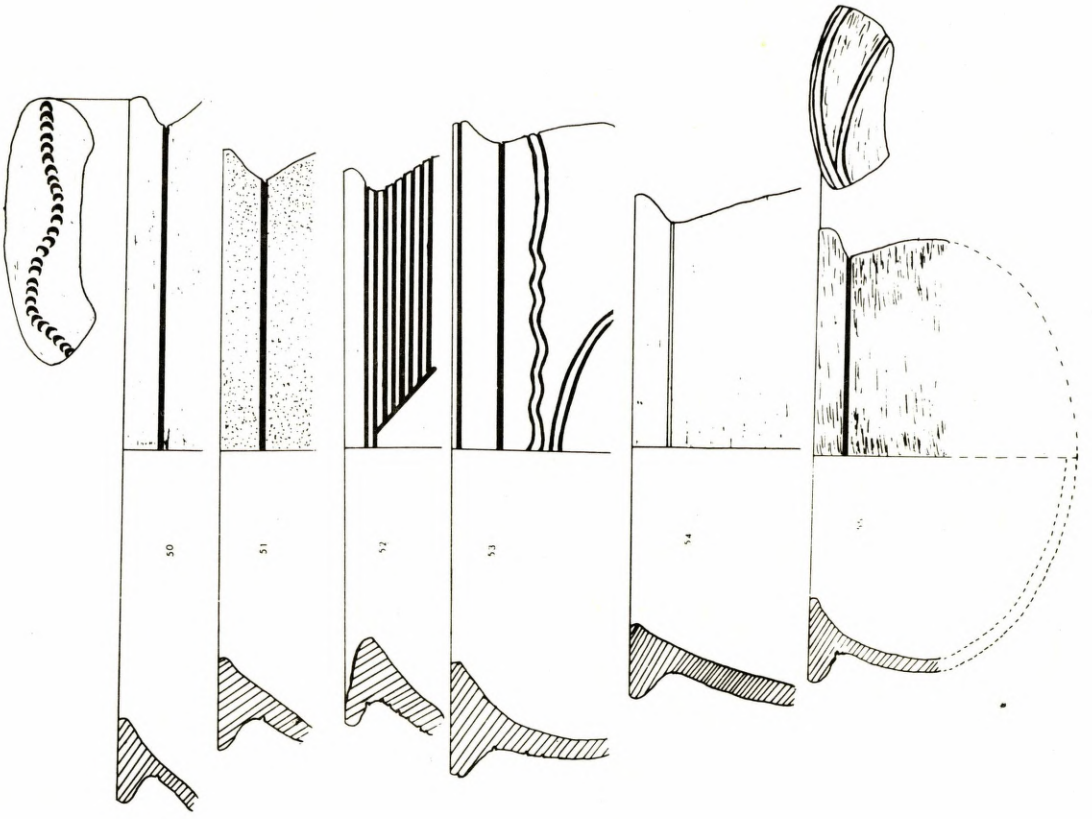
Jars in this class flare out to an abruptly inverted rim. Their rim diameter is more or less equal to the greatest body diameter; from the shoulder the body may curve gently as in the specimens from Ogoloma (Figs. IX.44 and 45). The body diameter may also be slightly less than the rim diameter in the broad rimmed specimen from Okochiri (Fig. IX.46). These jars are also thin-walled. Decorations are largely restricted to the body. They may be light combed continuous horizontal wavy lines (Fig. IX.44), short diagonal incisions bounded from the top by a band of two horizontal grooved lines and below by pendant triangles (Fig. IX.45) or the droplet shaped impressed motifs (Fig. IX.46).

Class 17 Large wide-mouthed, shouldered jars

This class of jars has a thickened broad flat rim top. In most cases their greatest body diameters equal their rim diameters. From the shoulder there is a short angular flare. The body may be straight sided (Figs. IX.47-49, 53, 54) or ovoid (Figs. IX.50-52). The body wall is usually thick (Figs. IX.47, 50). Slight variations in size and reinversion of the rim are found as in Fig. IX.53. Their interior is domed. Body decoration is restricted to the linear grooves arranged horizontally (Figs. IX.52, 53) vertically or obliquely (Fig. IX.48) or a combination of these (Figs. IX.48, 49). The upper surface of the rim may be decorated with a crescent shaped motif arranged in a single wavy row (Figs. IX.47, 50). This motif may have been impressed by the finger nail or with a sea shell.

Class 18 Small globular, shouldered jars

This is a rather varied class of jars which is normally wide-mouthed (Figs. IX.55, 56) although the one variant from Onyoma (Fig. IX.57) is narrow-mouthed, and has a rim diameter by far less than the greatest body diameter. Their unity lies in their small globular shape. In the Okochiri specimens (Fig. IX.55, 56) where the rim diameter may equal the greatest body diameter, there is a variation to the rim profile. While in Fig. IX.55 the rim is broad and thickened giving the jar a spherical profile when viewed from the interior, the flare of Fig. IX.56 which ends in a thin flat, everted rim makes it a variant of this class. There is a possibility that they were used for collecting or transporting water between source and home, between home and work place (Fig. IX.57) or for bathing (Figs. IX.55, 56) as modern parallels suggest.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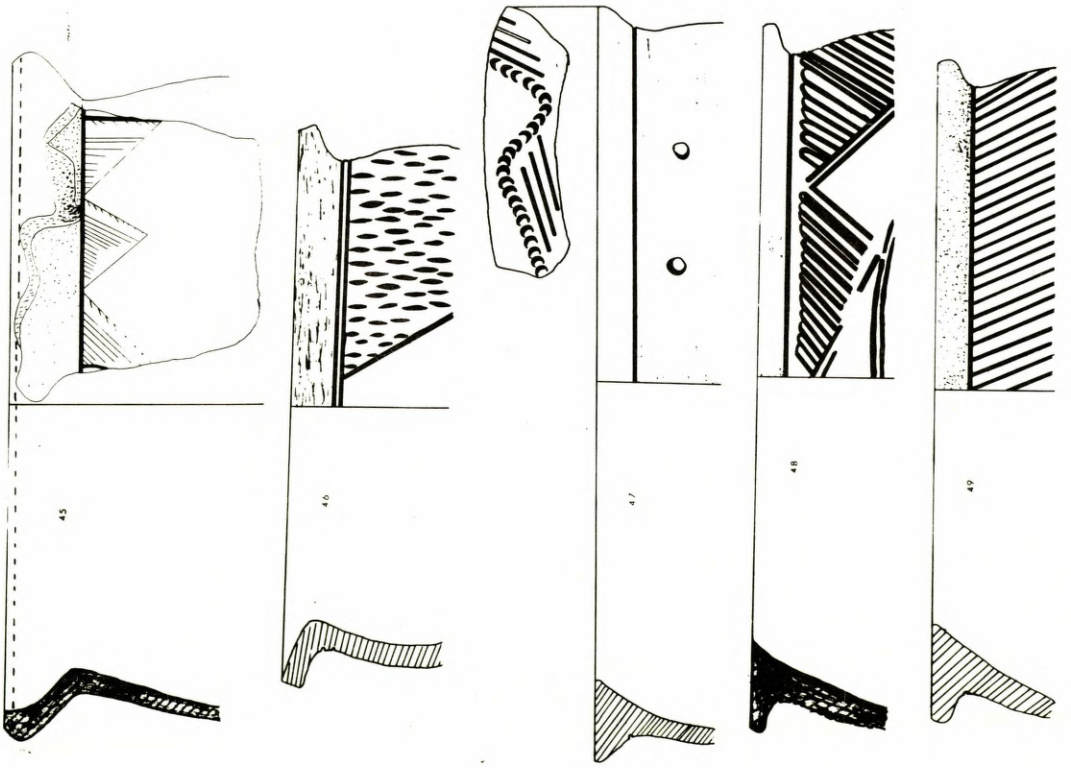
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Class 19 Neckless jars

This class of jars has two variations which are initially recognizable by their rim profile. One variant is large, usually wide-mouthed, semi-spherical and has an inverted rim which may be slightly flared and simply inverted (Fig. IX.58), reinverted (Fig. IX.59) or without inversion (Fig. IX.60). The second variant is consistently spherical with inverted rims (Figs. IX.61-64). The first variant is predominantly known from Okochiri while the second is known from Ogoloma and Okochiri although it occurs in limited quantities at other sites. Decorations are confined towards the rim and may be the simple grooved lines (Figs. IX.58, 59), the broad L-motif (Fig. IX.63), semi-circular grooves (Fig. IX.60), series of combined continuous wavy lines (Fig. IX.60), and a combination of combed lines with irregular capsule-shaped bosses (Fig. IX.64).

Class 20 Small cylindrical-shaped vessels

This class is made up of small vessels which show a range of variations. The vessels have a cylindrically shaped body, a gradual flare which ends in a simple everted rim (Figs. IX.65-67).

Class 21 Small oval-shaped vessels

This is oval-shaped with small rim diameter (Figs. IX.68, 69). A series of step-wise rows of bosses cover the top third portion of Fig. IX.69.

Class 22 Small, shallow baggy vessels

This class consists of shallow, baggy cups (Fig. IX.70). This bears the same general profile as Fig. IX.15.

Class 23 Plain Ovoid vessels

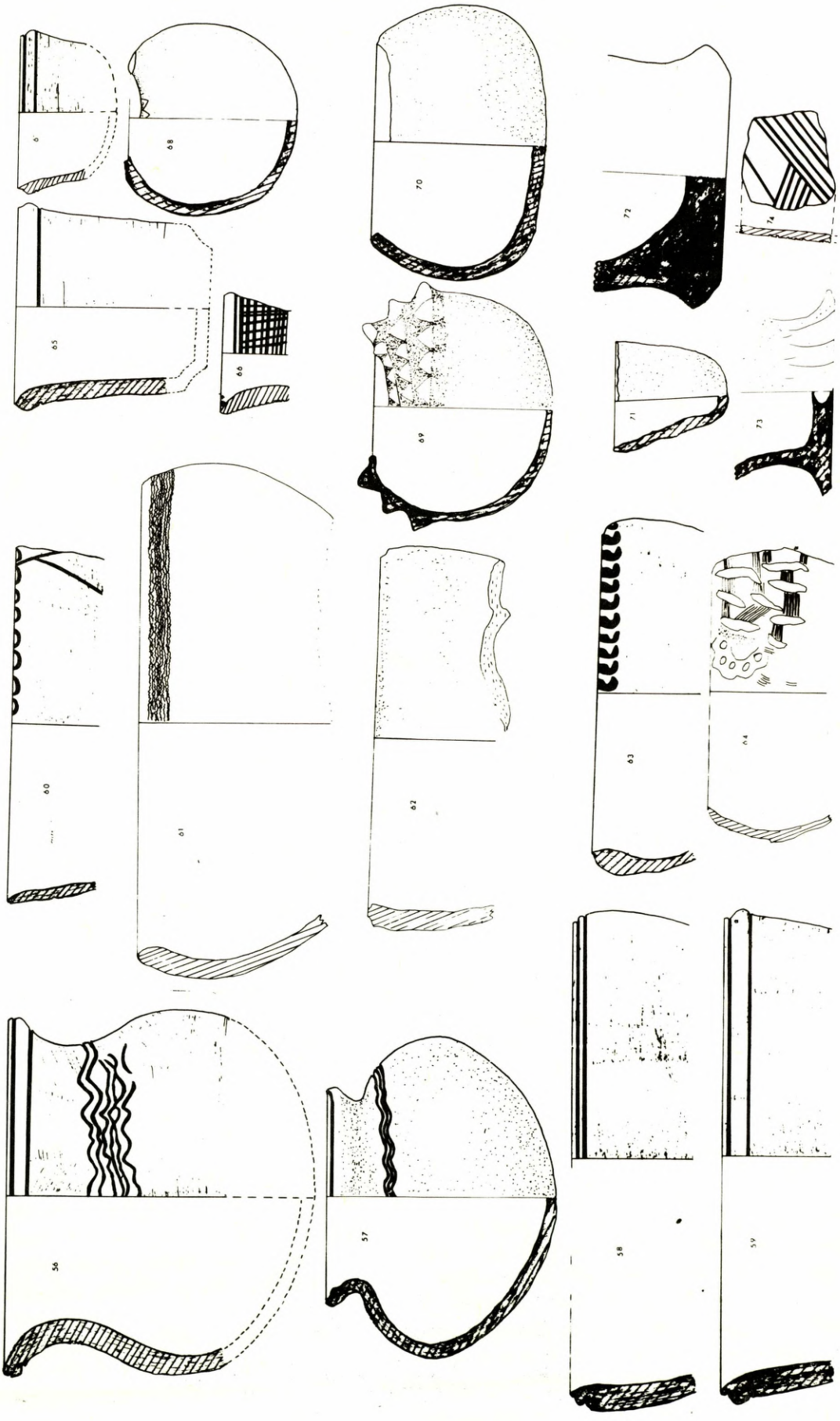
These are spherical, small and have an orifice no larger than 2 cm in diameter which suggests that they were intended for the dipping of one finger at a time. One specimen does not even possess an orifice. This sub-class is known mainly from Ogoloma.

Class 24 'Crucibles'

These are conical, with thick irregular walls and are common at Ke (Fig. IX.71). These resemble modern crucibles used for copper melting in Benin (Connah 1975, Figure 34, No. 15). These crucibles may be linked with the moulds and tuyères-like nozzles from Ke as suggestive of some form of metal working but showed no trace of use.

Class 25 Perforated pots

Only fragments of perforated pots were recovered although two rim sherds of this class show that they were necked and perhaps lidded too. The perforations were made while the pots were still unfired. As I observed in the field in 1977, perforation has functional and ritual aspects. Pots of this class are today used for drying or smoking fish, crustaceans, meat and spices. They could also have been used as strainers and sieves in which case they must have been neckless, shallow or even shouldered. Modern parallels are common (pers. observ. at Nsukka and Obibi markets 1977). When perforation is confined to a few narrow holes at the top part of the pot they show a restriction to



ritual usage. The perforations may also be used to produce an effect in musical instruments. In this case the holes are wider than they are in other circumstances in which perforations are known. Thus although perforations may be applied after the pot has been made and does add to the aesthetic value of the pot, it is not a decoration in the true sense of the word and therefore has not been so treated here.

Class 26 Pot stands

The stand resembles an inverted neck and rim sherd of the large-globular necked pots or shouldered jars. There are two variants of this class: a) one which is open and looks exactly like the neck of the large globular pots. This variant has a wide range of sizes to accommodate the different sizes of pots the potter manufactures. Some may have been necks of discarded pots although the bulk has been specially made for this purpose. A modern parallel of this variant is shown in Nzewunwa (1979, Plate 41), where they are stacked in front of a potter's house at Ogu near Okochiri (pers. observ. 1977). Here they number about 45. b) A second variant of the pot stand has a similar external shape but has a closed end at the point of inflection. This leaves a hollow below the partition which gives the stand an appearance of a basal rim. The two variations are differentiated from pot necks and pot bases by the considerable amount of weathering at the end where the stand makes contact with the ground in the process of manufacture. Again they have a broad smooth upper brim which differs from the rough edges of accidental breakpoints found on utility pots. Their occurrence at Ogoloma where no potting tradition is recorded may mean that they were used for standing domestic pots.

Class 27 Lids

Very few fragments of lids were recovered, all from Ogoloma. Their form shows that they generally fit flatly over a vessel's mouth. Being socketed lids they flange over the vessel mouth. These lids may be concave, flat, convex and have points or more generally knobs in the centre of the top. A decorated lid with elongated handles was recovered from the surface at Ke.

Class 28 Heavy thick-walled trough-shaped vessels

These trough-shaped thick-walled heavy vessels show occasional cracks perhaps as a result of being subjected to high temperatures. They resemble moulds for metal casting, but it is not clear whether they were used for casting ingots. They are known only from Ke. Their association with crucibles appears to support the idea that they were used for some type of metal working. These mould-like vessels occur in large quantities in the Ke middens.

Class 29 Tuyères-like nozzles

These are long, narrow, and pipe-like, and taper slightly towards a concave base. Almost all the objects are open at one end and among those with the two ends open, the opening at one end appears to be accidental in some cases. Generally the objects have rough uneven thin walls, uneven rough rimless lips. In general they may have been used for melting down metals.

Class 30 Large egg-shaped vessels

These are oval, smooth-surfaced, thin-walled and fragile. The known specimens come from Saikiripogu. They are not decorated and possess an

orifice less than 3 cm in diameter. It is not known how they were intended to be used but a number of them contain sediments and stains of white 'chalk'. It suggests that they served as storage pots for liquids such as palm oil, fermented liquor or some perhaps were used in the manufacture of paint from crushed sea shells.

Class 31 Mortars

They are hard-fired, heavy, thin-lipped. They are lumpy and thick-walled, resembling in large measure the moulds of Ke and Saikiripogu. They may have been used for pounding or grinding medicines, cosmetics, even spices. All were recovered from Onyoma.

Class 32 Wheel-made glazed plates and vases

These plates are thin-walled, wheel-made and white glazed. Decorative designs are painted linear bands, floral and faunal (usually insect) patterns, in red, green, brown, yellow, blue on white background; heavy thick-walled brown. This class is known mostly from body fragments. The neck fragments show that it was long and narrow-necked with a flat lidded top or stoppered top.

Class 33 Miscellaneous fragments

i) Handles. Three handles were recovered from Ogoloma. They were decorated in a twisted cord-like fashion. Handles from Saikiripogu and Ke are in such small fragments that it is not possible to reconstruct their original shape and sizes. There is no evidence of the type of vessels to which they belonged, but it seems that handled-vessels were rare in the Niger delta.

ii) Bosses. Bosses are rare although they are known from all the sites. Illustrated examples include Figs. IX.3, 47, 69.

iii) Bases. Very few bases were recovered from the excavations. The illustrated specimens are from Ke. The exact shape of their upper body is not known. The bases may be thick-walled, flat and high-waisted (Fig. IX.72) or they may be thin-walled, flat, concave and low-waisted (Fig. IX.73).

c) Decoration

It is not known yet what tools were used for decorating pots but information obtained from modern potters in Ogu in the eastern Niger delta and Umueje in the Niger-Anambra Valley (pers. observ. 1977) shows that a wooden stylus is used for incisions and grooving. Sea shells of different species were also used for some of the combing and impressed decorations. It can also be seen that the finger nail, the finger tip and leaves were also used. No tool used for decoration has been recovered in the excavations.

Decorative Techniques

The decorative techniques found are:

(i) Grooving/channelling
(ii) Incision
(iii) Combing
(iv) Impression/stamping
(v) Stabbing
(vi) Applied decoration

(vii) Glazing
(viii) Painting
(ix) Slipping

"Both shape and the purpose for which the ware is made should determine to a great extent the type of tool that should be used and which colour and finish to select" (Anenechukwu 1976: 20). This accounts for the absence of decoration on some pots and in fact why they look unfinished and crude.

These techniques applied either singly or compositively account for the varied patterns which are described and illustrated below. The simplicity of the decorations and the containers themselves accounts for the absence of clear-cut identification of particular classes with particular decorations in this analysis.

(i) Grooving/channelling

This decoration consists of deep wide incised lines produced with a blunt instrument. It is applied in a variety of ways with single or multiple lines but is usually unidirectional, for example, they may be horizontal as in Figs. IX. 21, 26-30 or multi-directional in a zoned pattern as in Figs. IX.11, 74-76. They may also be concentric or semi-concentric as in Figs. IX.19, 20, 77, 78. At times they are criss-crossed as in Figs. IX.7, 66, 79, 80. Other examples in this class of decoration are Figs. IX.10, 81. In all known cases they were applied before firing.

(ii) Incision

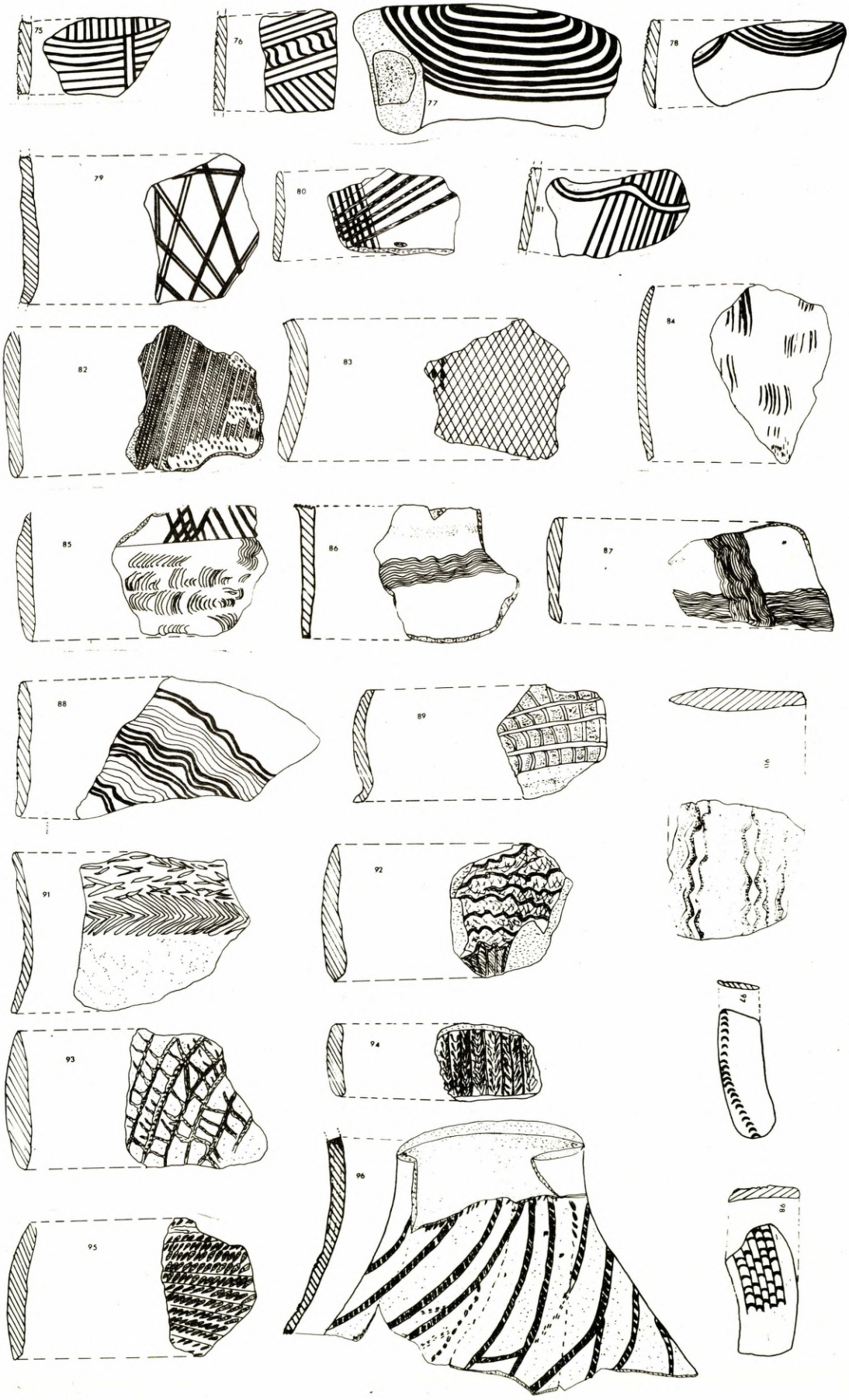
Incised lines are shallow and narrow and produced by using a rigid sharp pointed object. They could be horizontal (Fig. IX.25); used to zone off other decorations (Fig. IX.82), cross hatched (Fig. IX.83). Incision could be applied as a continuous long line or as short and intermittent lines as in Figs. IX.79, 45, 14 or even in a wavy form as if combed (Fig. IX.34).

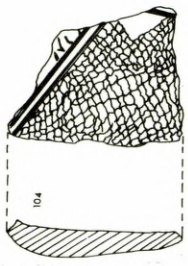
(iii) Combing

This decoration is made up of lines which are parallel, light, narrow and shallow. Usually they appear in multiples because multi-toothed instruments are used. They may be short, intermittent and grouped (Fig. IX.84); arched and clustered as they are on the lower part of Fig. IX.85. A variant of this decoration is the series of the continuous wavy lines which are usually arranged horizontally as in Figs. IX.31, 36, 56, 86-88. Other forms of combed decoration encorporate different arrangements of short and intermittent, with long, straight, continuous combed lines (Figs. IX.89, 90); with sinuous and fibrous patterns as in Figs. IX.92, 93; or a herring-bone pattern (Figs. IX.91, 94).

(iv) Impression/stamping

This decoration is produced by stamping or impressing on an unfired pot. Variation in this decoration reflects the variety in the objects used for applying the decoration. Decorations from stamped objects may be capsule- or leaf-shaped (Figs. IX.3, 26, 95, 96); may appear banded, cord marked or interrupted marked (Figs. IX.39, 43, 97, 98). Some stamped decoration may be in the form of irregular blocks (Figs. IX.99, 100); may be pinched with the finger nail or sea shell (Figs. IX.101-103). Other marked patterns from impressed decoration are the net impressions of Fig. IX.104 or the L-shaped

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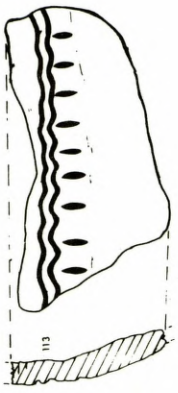
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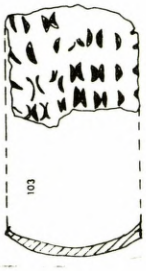
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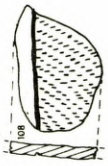
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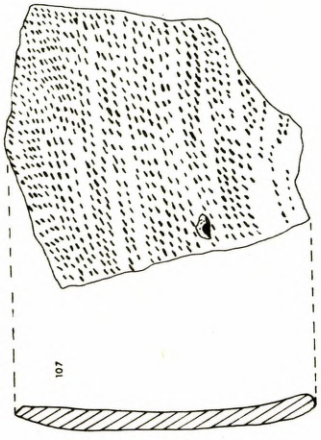
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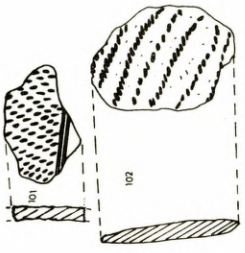
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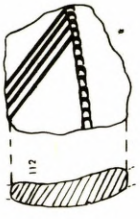
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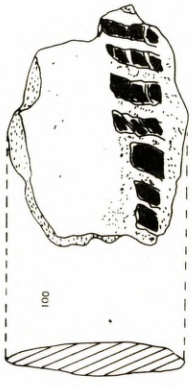
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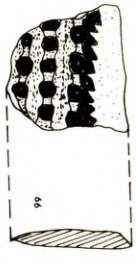
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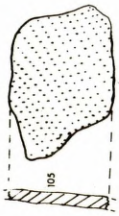
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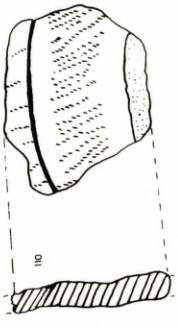
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decoration of Fig. IX.63 or blotched circles of Fig. IX.6, 41, 42. They are also applied in different combinations with groovings (Figs. IX.109, 111-113). When applied as punctates stamping consists of dots over the pot or in combination with other decorations (Fig. IX.105, 106).

(v) Stabbing

This decoration consists of very short, deep incisions which may be broadcast over the entire surface of the pot (Figs. IX.107, 108, 110). They do also appear in combination with other decorations. It is not widely used probably because it is time consuming especially where it is applied in a linear pattern.

(vi) Applied decoration

In this class of decoration some external clay is added to the pot either in the process of or after manufacture had been concluded. These added parts to the pot may range from bosses to cordons as well as the decorations on them (Figs. IX.7, 64).

(vii) Glazing

Glazing is applied to all wheel made ceramic materials of class 32. It is restricted to imported ware and totally absent from the locally made ceramic containers.

(viii) Painting

Among the unglazed sherds studied there was no evidence of painting. However, painting was a predominant feature of the glazed ceramic ware on which it was applied as bands, lines and the delineation of natural objects such as butterflies. The paint may be red, yellow, blue, green or brown, applied in combination to reflect different features or singly in the case of bands and lines but these are usually painted over a white background and then refined.

(ix) Slipping

Slipping appears to be a highly restricted method of decoration in the eastern Niger delta. It is restricted to the long-necked pots of Classes 9 and 10 (Figs. IX.18-21) from Ogoloma and Ke and the small shallow saucer-shaped bowls of Class 2 (Figs. IX.3, 4, 6) from Ogoloma. It appears to have been used on the short-necked jars of Class 12 (Figs. IX.24-32) from Okochiri and possibly also on other sites but the extent of weathering makes it difficult to confirm the observation.

Relative Frequencies of Decorations

The relative frequencies of incised lines whether channels or simple grooves are high in all the sites excavated as can be seen from Table IX.1, but in Ogoloma impressed decoration accounts for 34.7% of the total decoration while grooving accounts for 18.5%. Combed decoration is fairly consistently high in all the sites except Okochiri. Fig. IX.114 better illustrates the frequencies of decorations. Painting is confined to glazed vessels and these are wheel made and foreign to West Africa. This type of decoration is not employed in local ceramic industries. Slipping appears to be restricted to utility pots used for social functions and absent in the general or all purpose vessels. Again applied decorations are known largely from Ogoloma. See also Fig. IX.115.

Table IX.1 Relative Frequencies of Major Decorations

| | Dec. sherds | Impression | Dragging/ Combing | Grooving | Incision | Stabbing | Applied | Multiple Decor | Other |
|---|---|---|---|---|---|---|---|---|---|
| OKOCHIRI | | | | | | | | | |
| I | 34 | 5 | 2 | 21 | 3 | | | 1 | 1 |
| II | 35 | 2 | 7 | 22 | 1 | | | 3 | |
| III | 65 | 10 | 3 | 30 | 10 | 4 | 1 | 3 | 2 |
| IV | 38 | 1 | 1 | 21 | 7 | 2 | 3 | 1 | 4 |
| Total | 171 | 18 | 13 | 94 | 21 | 6 | 4 | 8 | 7 |
| % | | 10.5 | 7.6 | 54.9 | 12.3 | 3.5 | 2.3 | 4.7 | 4 |
| OGOLOMA | | | | | | | | | |
| IA | 580 | 200 | 113 | 107 | 55 | 30 | 8 | 32 | 35 |
| IB | 278 | 80 | 105 | 35 | 6 | 18 | 6 | 2 | 26 |
| IC | 306 | 129 | 70 | 62 | 18 | 8 | 3 | 9 | 7 |
| ID | 64 | 17 | 15 | 23 | 5 | 1 | - | 2 | 1 |
| Total | 1228 | 426 | 303 | 227 | 84 | 57 | 17 | 45 | 69 |
| % | | 34.7 | 24.7 | 18.5 | 6.8 | 4.6 | 1.4 | 3.7 | 5.6 |
| ONYOMA | | | | | | | | | |
| IA | 33 | 9 | 9 | 7 | 5 | - | | 1 | 2 |
| IB | 12 | 2 | 5 | 4 | - | 1 | | - | |
| II | 19 | - | 6 | 7 | - | - | | | 6 |
| Total | 64 | 11 | 20 | 18 | 5 | 1 | | | 8 |
| % | | 17.2 | 31.3 | 28.1 | 7.8 | 1.6 | ? | 1.6 | 12.5 |
| SAIKIRIPOGU | | | | | | | | | |
| I | 69 | 10 | 17 | 23 | 11 | 1 | - | 3 | 4 |
| II | 87 | 16 | 6 | 45 | 11 | - | - | 9 | - |
| III | 279 | 33 | 39 | 67 | 36 | 1 | | 31 | 4 |
| Total | 367 | 59 | 62 | 135 | 58 | 2 | | 43 | 8 |
| % | | 16.1 | 16.9 | 36.8 | 15.8 | 0.5 | | 11.7 | 2.2 |
| TOTALS | 1830 | 514 | 398 | 474 | 168 | 66 | 21 | 103 | 85 |
| % | | 28.1 | 21.7 | 25.9 | 9.2 | 3.6 | 1.1 | 5.6 | 4.6 |

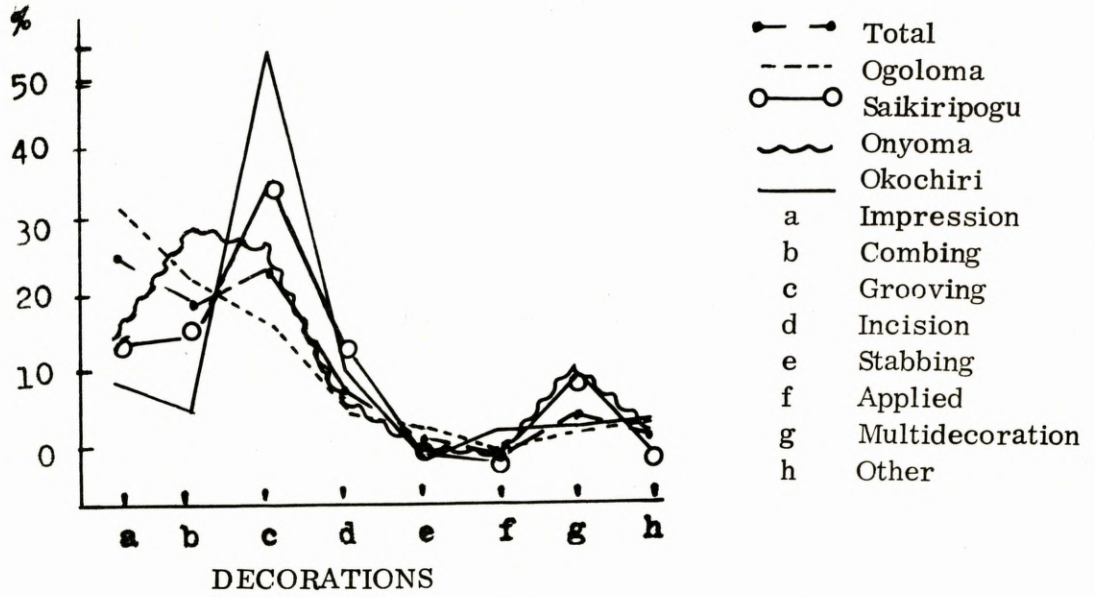



Figure IX. 114 Relative Frequency of Decorations

Figure IX. 116 Position of Decoration on on Rimmed Sherds (in %)

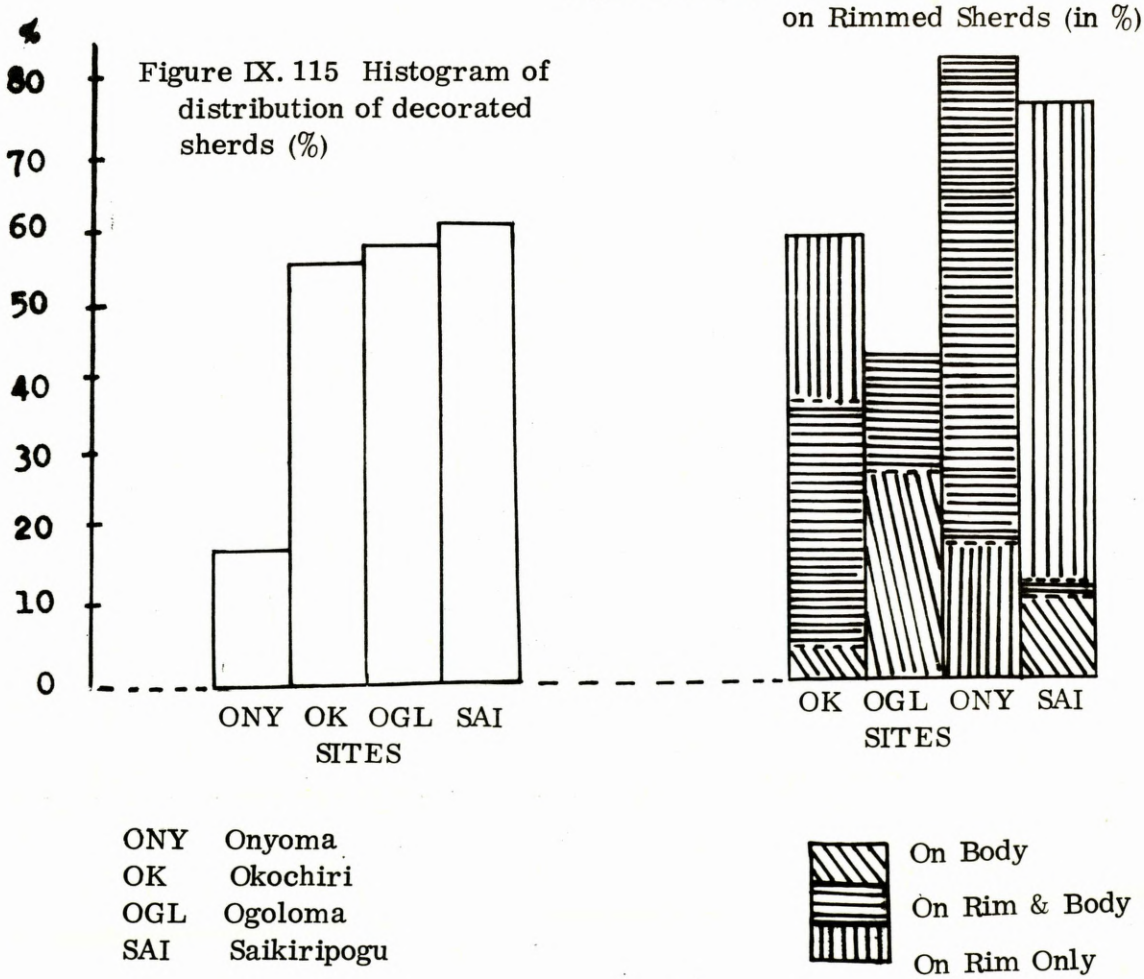



Figure IX. 115 Histogram of distribution of decorated sherds (%)

Position of Decoration

In considering the position of decoration four zones were identified as those parts of the pot on which decoration was applied: (i) on the rim only, (ii) on the rim and the body, (iii) on the body only, (iv) on the body where no rim exists. Although these sub-sets of information were monitored for the entire group studied, it was found that the inclusion of body sherd decorations where no rim exists created problems of duplication because many pot sherds of the same decoration may belong to one pot but could be counted as separate entities. In the summary chart (Table IX.2) therefore only rim sherds had been used.

Presented in a form of histogram (Fig. IX.116) it is possible to isolate some trends within the sites too. Rims and necks are the favoured position of decoration with over 41.3% of the total. This is particularly pronounced in Saikiripogu and Okochiri although the trend is partially shared by Ogoloma. Decoration at the top of the body when both rim and body are recovered together is the next predominant position (37.6%) of decoration. This is particularly the case in Onyoma where most of the decorated rim sherds belong to the neckless class in which body and rim easily merge. It does not explain the general style at Ogoloma because the sherds of Ogoloma in general show elaborate decoration spread over the rim and body unlike Onyoma where decoration is highly restricted. It is equally strange that the sherds of Saikiripogu, which are largely neckless, deviate from the Onyoma pattern. Perhaps this is because Saikiripogu pottery is particularly decorated on the neck and rim when necked and neckless respectively, and therefore may not compare well with the less decorated sherds of Onyoma.

The decoration of the body only, where the body, rim and neck portions are recovered, appears to have been the least favoured of the positions. This may not have been the case because the numerous number of decorated body sherds without rims might in the end prove to belong to vessels whose rims and necks were not decorated. Therefore an explanation of the trends must take this factor into consideration.

d) Fabric

Considering that considerable amount of weathering has taken place on most of the potsherds, it is often difficult without making fresh breaks to be certain what the original fabric must have been like. The sherds were examined physically and their fabric was assessed in terms of being 'smooth'-or 'rough'-textured in cross section. It was difficult to relate either of these two broad characteristics of fabric to specific functions. The observed tendency was for service vessels such as dishes, bowls and jars to be of fine composition without stone tempered inclusions and to be generally well-fired.

e) Temper

All the pottery was lightly tempered. When inspected with the aid of a hand lens four tempering materials were predominant—'grog' (ground sherd), ground shell, pounded stone grit and a combination of these. In Okochiri and Ogoloma grit accounts for 70% of the total, ground sherd for 20% at Okochiri and 8.2% for Ogoloma, with a combination of grit and shell accounting for over 10%. Ground shell and some vegetable matter (leaves) appear to

Table IX.2 Frequency of Position of Decoration on Rim Sherds

| Site & Pit | Total Decor. Rims | On Rim Only | Rim & Body | Body Only |
|---|---|---|---|---|
| OKOCHIRI | | | | |
| I | 24 | 18 | 5 | 1 |
| II | 16 | 3 | 12 | 1 |
| III | 37 | 23 | 12 | 2 |
| IV | 17 | 11 | 6 | |
| Total | 94 | 55 | 35 | 4 |
| % | | 58.5 | 37.2 | 4.3 |
| OGOLOMA | | | | |
| IA | 256 | 89 | 64 | 103 |
| IB | 63 | 12 | 37 | 14 |
| IC | 108 | 22 | 77 | 9 |
| ID | 34 | 8 | 23 | 3 |
| Total | 461 | 131 | 201 | 129 |
| % | | 28.4 | 43.6 | 28 |
| ONYOMA | | | | |
| IA | 3 | 1 | 2 | |
| IB | 2 | | 2 | |
| II | 6 | 1 | 5 | |
| Total | 11 | 2 | 9 | |
| % | | 18.2 | 81.8 | ? |
| SAIKIRIPOGU | | | | |
| I | 25 | 18 | 4 | 3 |
| II | 34 | 28 | 3 | 3 |
| III | 70 | 53 | 9 | 8 |
| Total | 129 | 99 | 16 | 14 |
| % | | 76.7 | 12.4 | 10.9 |
| TOTALS | 695 | 287 | 261 | 147 |
| | % | 41.3 | 37.6 | 21.2 |

Table IX.3 Distribution of Classes of Ceramic Materials from Five Niger Delta Sites

| Site | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Onyoma | x | x | x | | x | | x | ? | | | x | | | x | | ? | | x | x | | | x | | | | | ? | | | | x | | x |
| Saiki-ripogu | x | x | x | | x | | | ? | x | | | | | x | x | ? | | ? | x | | | ? | | | x | | ? | | | x | | | x |
| Ke | | x | x | | ? | | | ? | x | ? | x | | x | x | | x | x | x | x | | x | | ? | x | x | x | x | x | | | x | x |
| Ogolo-ma | x | x | x | x | x | | x | x | x | x | | x | x | x | x | x | ? | x | x | | x | | x | | x | x | x | | | | | x | x |
| Oko-chiri | | x | x | x | x | x | | x | | ? | | x | x | x | | x | x | x | x | x | | | | | x | | x | | | | | | x |

Figure IX.117 Some Potting Centres of Southern Nigeria

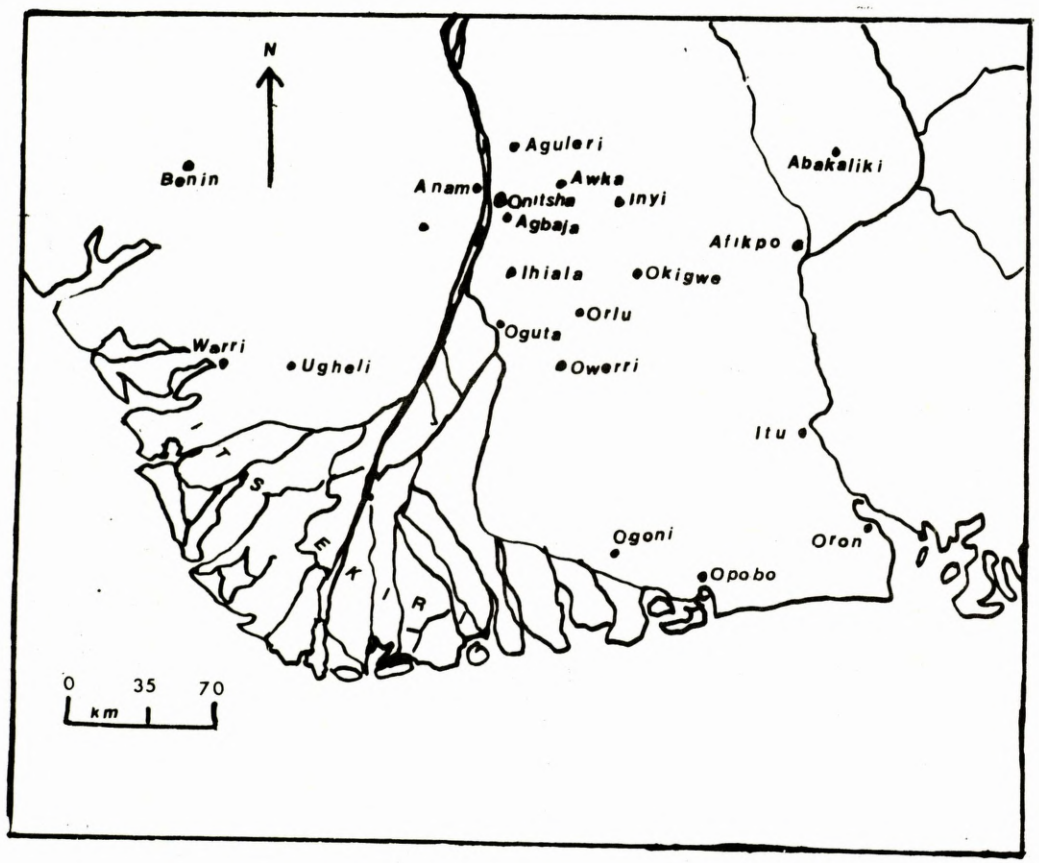
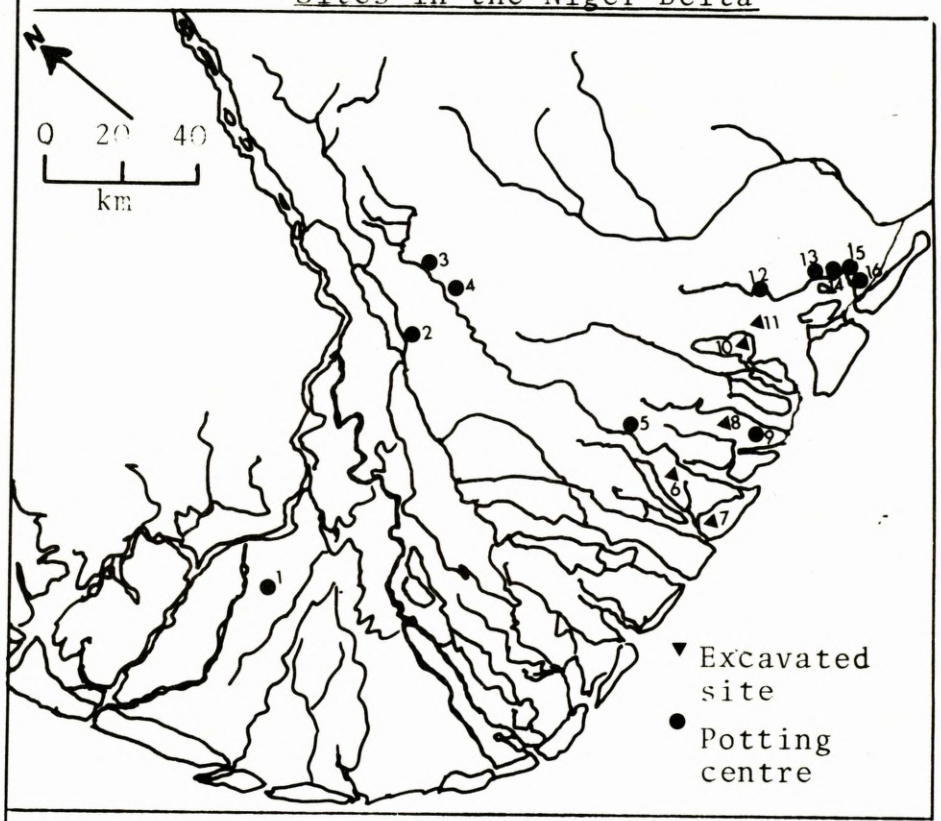



Figure IX.118 Potting Centres and Excavated Sites in the Niger Delta




1. Itsekiri centres
2. Obuburu
3. Ubima
4. Egbeda
5. Ilelema
6. Onyoma
7. Saikiripogu
8. Ke
9. Lelema
10. Ogoloma
11. Okochiri
12. Ogu
13. Lugbara
14. Kwawa
15. Buan
16. Kono

have been used in tempering some of the Saikiripogu pots although 'grog' and grit predominate. The grit used in all cases consists of waterworn white or brown sand stone particles which may be angular or round. It may measure about 0.4 mm for the very small ones, 1-2 mm for the medium and up to 5 mm at Okochiri and a little less at Ogoloma. In Saikiripogu a maximum grit size of 8 mm is known.

f) Colour

This seems irrelevant to any study since the four colours grey, brown, black and red were differentiated on the sherds excluding the glazed wares. They may occur singly or in combination on a sherd. Colours reflect not only the composition of the clay but also the effects of firing. About 30% of the sherds from Okochiri show a darker core in cross section perhaps as a result of short firing time. The contemporary method of drying large pots after purchase or while in use, by placing them over a smoky fire probably resulted in blackened insides. Open bonfire firing using wood and leaves over and around a pile of pots equally resulted in black areas on the vessels. The red ones resulted from the colour of the clay or from the temperatures attained by the firing process. None of the local vessels appears to have been fired in a kiln as kilns are hardly known and used even today.

3. Archaeological Discussion

Using primarily the criteria of shape and secondly decorations the ceramic materials represented in the 11 excavations from the eastern Niger delta divide into three traditions with geographical identity:

a) Onyoma area
b) Saikiripogu and Ke area
c) Okochiri and Ogoloma area

These traditions are generalized because within each tradition there are some differences as there are also within sites. It is not clear what these differences represent but they could reflect the sources of the ceramic products, differences in the age of the middens and the different levels within the middens themsleves. Some of these manifestations are discussed in Chapter X. However it may be observed that Onyoma shows greater affinity to Saikiripogu than the other sites while Ke shows secondary affinity to Ogoloma and Okochiri than to Onyoma. In all cases Okochiri and Ogoloma were far removed from Onyoma although of the main sites Ogoloma showed the remotest correlation with Onyoma (Figure IX.118).

On a wider geographical relationship, the eastern Niger delta pottery lacks the sophisticated, intricate if also delicate decorations of Igboukwu (Shaw 1970) and Benin (Connah 1975). Although there are pottery shapes of Connah's form I from the Niger delta sites, they are not represented with equal treatment. Similarly, the eastern Niger delta pottery shows marked differences from that of Afikpo (Chikwendu 1977) in external morphology and surface treatment. It is expected that these sites so widely separated in space and to some extent in time too should exhibit marked differences but it is hoped that as research progresses it may be possible to identify stop gaps between the highly artistic and the very simple utilitarian pottery of eastern and indeed southern Nigeria. At the moment the kind of data needed to amplify these details are not available.

**Table IX.4** Catalogue Numbers of Pottery Specimens Used for Illustrations in Chapter IX

Legend

| | |
|---|---|
| ONY | Onyoma |
| OK | Okochiri |
| OGL | Ogoloma |
| S | Saikiripogu |
| KE | Ke |

| Figure No. | Catalogue No. | Class |
|---|---|---|
| IX 1 | ONY.1.13 | 1 |
| 2 | S.III.2114 | " |
| 3 | OGL.1.265 | 2 |
| 4 | OGL.5.4458 | " |
| 5 | ONY.I.S.11/5 | " |
| 6 | OGL.4.1074 | " |
| 7 | OGL 2665 | 3 |
| 8 | OK.III.12.6 | " |
| 9 | OK.III.15.3 | 4 |
| 10 | S.1.5.565 | 5 |
| 11 | OK.IV.5.6 | " |
| 12 | OK.III.17.5 | " |
| 13 | OK.III.16.16 | 6 |
| 14 | ONY.I.S.10 | 7 |
| 15 | OGL.14.2104 | " |
| 16 | ONY.II.25 | " |
| 17 | OK.II.1.9 | 8 |
| 18 | OGL.3.2042 | 9 |
| 19 | KE III.19 | " |
| 20 | KE III.19 | " |
| 21 | OGL.4.4348 | 10 |
| 22 | KE.S.12/1 | 11 |
| 23 | ONY.II.15 | " |
| 24 | OK.I.2.16 | 12 |
| 25 | OK.II.2.84 | " |
| 26 | OK.III.16.18 | " |
| 27 | OK.III.12.7 | 13 |
| 28 | OK.I.3.20 | " |

Table IX.4 (cont.)

| Figure No. | Catalogue No. | Class |
|---|---|---|
| 29 | OK.1.3.25 | " |
| 30 | OK.1.3.4 | " |
| 31 | OK.II.5.2 | " |
| 32 | OK.II.1.3 | " |
| 33 | OK.IV.7.2 | 14 |
| 34 | OGL.4460 | " |
| 35 | OGL.1.2521 | " |
| 36 | OGL.5.449 | " |
| 37 | OGL.7.4190 | " |
| 38 | OGL.2.3019 | " |
| 39 | OGL.3.4049 | " |
| 40 | OGL.5.4459 | " |
| 41 | OGL.4350 | 15 |
| 42 | OGL.5.407 | " |
| 43 | OGL.1.2816 | " |
| 44 | OGL.1.2756 | 16 |
| 45 | OGL.3.4070 | " |
| 46 | OK.III.17.4 | " |
| 47 | OK.III.12.10 | 17 |
| 48 | OK..II.16.5 | " |
| 49 | OK.III.13.1 | " |
| 50 | OK.III.16.32 | " |
| 51 | OK.III.13.21 | " |
| 52 | OK.II.5.18 | " |
| 53 | OK.II.4.1 | " |
| 54 | OK.II.5.3 | " |
| 55 | OK.III.7.1 | 18 |
| 56 | OK.1.5.1 | " |
| 57 | OK.1.5.11/1 | " |
| 58 | OK.I.4.8 | 19 |
| 59 | OK.I.4.24 | " |
| 60 | OK.II.2.109 | " |
| 61 | OGL.3.2044 | " |
| 62 | OGL.3027 | " |
| 63 | OK.I.2.14 | " |
| 64 | OGL? | " |

Table IX. 4 (cont.)

| Figure No. | Catalogue No. | Class |
|---|---|---|
| 65 | OK.III.9.16 | 20 |
| 66 | OK.I.2.4 | " |
| 67 | OK.II.1.9 | " |
| 68 | KE.II.24/2 | 21 |
| 69 | KE.II.24/8 | " |
| 70 | ONY? | 22 |
| 71 | KE.III.15.D | 24 |
| 72 | KE.III.16 | 33 |
| 73 | KE.III.2 | " |
| 74 | OK.IV.7.5 | Decorations |
| 75 | OK.II.3.9 | " |
| 76 | OK.III.14.42 | " |
| 77 | KE.II.2414 | " |
| 78 | OK.III.5.1 | " |
| 79 | OK.III.13.20 | " |
| 80 | OGL.1.2819 | " |
| 81 | OK.II.1.1 | " |
| 82 | OGL.1 | " |
| 83 | OGL.5.4519 | " |
| 84 | OGL.5.4517 | " |
| 85 | OGL.5.4492 | " |
| 86 | OGL.2577 | " |
| 87 | OGL.5.4514 | " |
| 88 | OGL.1.2577 | " |
| 89 | OGL.5.4489 | " |
| 90 | OGL.5.4484 | " |
| 91 | OGL.4.1040 | " |
| 92 | OGL.5.3221 | " |
| 93 | OGL.5.4490 | " |
| 94 | OGL.4244 | " |
| 95 | OGL.1.2658 | " |
| 96 | OGL.7.2435 | " |
| 97 | OK.II.5.16 Rim | Decoration |
| 98 | OK.II.5.18 Rim | " |
| 99 | OGL.1.3047 | " |
| 100 | OGL.5.4468 | " |
| 101 | OK.I.4.20 | " |

Table IX. 4 (cont.)

| Figure No. | Catalogue No. | Class |
|---|---|---|
| 102 | OGL.1.26.59 | Decoration |
| 103 | OGL.5.4503 | " |
| 104 | OGL.7.2932 | " |
| 105 | OK.III.3.12 | " |
| 106 | OK.III.3.8 | " |
| 107 | OGL.7.646 | " |
| 108 | OK.III.7.4 | " |
| 109 | OK.II.5.9 | " |
| 110 | OK.I.2.2 | " |
| 111 | OK.III.18.4 | " |
| 112 | OK.III.12.1 | " |
| 113 | OK.III.12.1 | " |

# CHAPTER X

## THE ARCHAEOLOGICAL SUCCESSION IN THE EAST NIGER DELTA

The previous chapters have analysed and discussed the ecological, archaeological and ethnographic data from the eastern Niger delta. It is now necessary to integrate the results into a general pattern of development through time in the delta. Discussion is therefore restricted after suggesting a series of models to:

a) the chronology of settlement in the Niger delta from its beginnings,

b) the cultural development in terms of
   (i) the economy and,
   (ii) the material culture.

### 1. Models for Human Exploitation of the Delta

Using the evidence of Part I (Chapters I-IV) it is legitimate to suggest how the delta was utilized by man through four periods of its history. This is possible because of its nature, the kinds of exploitation possible and a number of known events. The following stages must be considered.

#### a) Pure Hunter-Fisher-Collector Communities

The millennia prior to B.C. 2000 would be expected to consitiute the first phase of settlement in the Niger delta. Although the coastal delta may not have been fully occupied until there was a viable means of water transport, its fringes may have longprovided bases for periodic exploitation on foot at low tide. This purely shellfishing/fishing activity could have been successfully combined with a forest collecting activity and without any reliance on domesticated plants. It was in this way that the initial exploitation of the Niger delta must have begun, then these early groups would have been so few and far between that they could easily have been absorbed later by incoming groups with more advanced technology for the exploitation of the delta. Contact with outside groups at this first stage should be expected to be minimal both in ideas and the importation of materials from outside. Movement into the delta might have been along the coast or from the interior.

#### b) Hunter-Fisher-Collectors in Contact with Subsistence Agriculturalists

The period 2,000 B.C. - 1000 A.D. probably marks the beginnings of systematic settlement of the Niger delta inland plain fringes by groups from the interior coming from the west and north of the delta. Some settlements to the east must not be entirely ruled out. It should be expected that boats were known to the coastal groups at this time which must have facilitated their exploitation of the sandy beaches of the Atlantic sea board. The first communities of the coastal plain who practised agriculture must presumably have been yam cultivating using stone tools where these were available, or wooden

implements and fire. Iron tools must have been introduced in this period. Settlement of presumably yam-cultivating stone-axe using groups are, in fact, known within this period northeast of the Anambra Valley at Nsukka and at Afikpo on the Cross River Valley to the north of the eastern corner of the delta; these groups are fully pottery-using. The delta was certainly being exploited within this stage, right down to the coast at Ke, where the earliest evidence of pottery using was found. Salt and fish may have already been the mainstay of an exchange system with inland subsistence agriculturalists. No direct evidence can be offered of this phase.

c) Hunter-Fisher-Collector-Agriculturalists in Contact with Sophisticated Inland Communities

This period, c. 1000- c. 1500 A.D., marks the highest development of the delta contact with the interior without any overseas influence. In this period the delta communities must have been oriented towards the north possibly using the River Niger and its tributaries as the mainline of communication. There is in fact evidence of influence on the Niger delta by mainland groups to the northwest as in the succeeding periods, and by groups on the Niger-Anambra Valleys and north east of the delta. It may be suggested that in this period, long distance trading connections brought Malaysian/Asian crops, including the banana, to the delta. This stage should show the Niger delta as copper-bronze and probably iron-using. Certainly metallurgy was highly developed on the inland plain at Igboukwu at the beginning of this period, and further west, towards the end of the period in Ife and Benin.

d) Hunter-Fisher-Collector Agriculturalists in Contact with Sophisticated Overseas Communities

From c. 1500 A.D. for the first time, it would appear sea-borne influences are found. The delta became a meeting place for peoples from the interior and distant overseas lands with alien and sophisticated civilizations. Ideas and artefacts from Europe, Asia and the Americas are to be expected and local subsistence patterns might well be distorted. The delta was not fully iron-using and must have benefitted very much from new Ameriaan crops, especially cassava. Cultural influences might be expected from west of the Niger where indigenous urban civilization now reached a peak of development in Benin. There was also increased contact with the areas east of the Cross River down to the Cameroons and even beyond.

2. Chronology of Settlement in the Eastern Niger Delta

The basis of the chronology of the eastern Niger delta is twenty-two radiocarbon dates from 11 sites from different parts of the delta (Table X.1 lists them).

Reliability of the Dates

The conversion based on a radiocarbon age of 5730 years is used for the discussion below. About 36% of the samples are of shell and it needs to be pointed out that the dates have not been corrected in line with Olsson's (1973) warning on the contamination of marine shells because no live saltwater samples have been sent to the radiocarbon laboratory for this purpose.

Table X·1· Radiocarbon Dates from the Eastern Niger Delta

| S/NO. Ref. No. | Provenance | Type of Sample | C14 Age based on 5730 yrs | C14 Age based on 5568 yrs | Date in A.D. |
|---|---|---|---|---|---|
| ONYOMA | | | | | |
| 1. UI7205 | Ony I, 120 cm | Charcoal | 490 ± 70 | 475 ± 70 | 1460 ± 70 |
| 2. UI7206 | Ony I, 180 cm | Charcoal | 200 ± 95 | 195 ± 95 | 1750 ± 95 |
| 3. UI7207 | Ony II, 60 cm | Charcoal | 445 ± 85 | 430 ± 85 | 1505 ± 85 |
| 4. UI7208 | Ony II, 120 cm | Shell | 605 ± 80 | 385 ± 75 | 1355 ± 80 |
| 5. UI7209 | Ony I, 210 cm | Shell | 345 ± 85 | 335 ± 85 | 1605 ± 85 |
| KE | | | | | |
| 6. UI7210 | Ke I, 120 cm | Shell | 1100 ± 80 | 1060 ± 75 | 850 ± 80 |
| 7. UI7211 | Ke II, 300 cm | Shell | 980 ± 75 | 955 ± 75 | 970 ± 75 |
| 8. UI7212 | Ke I, 90 cm | Charcoal | 965 ± 150 | 935 ± 145 | 985 ± 105 |
| 9. UI7213 | Ke II, 210 cm | Charcoal | 350 ± 85 | 340 ± 80 | 1600 ± 65 |
| 10. UI7214 | Ke III, 330 cm | Shell | 765 ± 85 | 745 ± 80 | 1185 ± 85 |
| 11. UI7215 | Ke III, 330 cm | Shell | 790 ± 80 | 765 ± 75 | 1160 ± 80 |
| OGOLOMA | | | | | |
| 12. N2050 | Ogoloma B 78 cm | Charcoal | 110 ± 75 | 105 ± 70 | 1840 ± 75 |
| 13. N2051 | Ogoloma B 206 cm | Charcoal | 125 ± 75 | 120 ± 80 | 1825 ± 75 |
| 14. N2052 | Ogoloma A 360 cm | Charcoal | 605 ± 100 | 590 ± 95 | 1345 ± 100 |
| SAIKIRIPOGU | | | | | |
| 15. UNN 0025 | SI Level 6 100-120 cm | Charcoal | 815 ± 125 | 790 ± 120 | 1155 ± 125 |
| 16. UNN 0026 | SI Level 4 60-80 cm | Shell | 545 ± 60 | 530 ± 60 | 1405 ± 60 |
| 17. UNN 0027 | SIII Level 4 60-80 cm | Charcoal | 465 ± 125 | 450 ± 120 | 1485 ± 125 |
| 18. UNN 0028 | SIII Level 4 60-80 cm | Shell | 370 ± 60 | 360 ± 55 | 1580 ± 60 |
| OKOCHIRI | | | | | |
| 19. UNN 0050 | OK I 45 | Charcoal | 1010 ± 80 | 985 ± 75 | 940 ± 80 |
| 20. UNN 0052 | OK III 147 | Charcoal | 725 ± 85 | 705 ± 80 | 1225 ± 85 |
| 21. UNN 0053 | OK III 300 | Charcoal | 525 ± 90 | 510 ± 90 | 1425 ± 90 |
| 22. UNN* 0055 | OK IV 160 | Charcoal | 985 ± 85 | 960 ± 80 | 965 ± 85 |

There are also discrepancies between some dates and the stratigraphic levels from which the samples were derived. From Onyoma I, the earliest date comes from the uppermost level (UI 7205) showing that some inversion of material had taken place. Whether this discrepancy resulted from contamination or from a factor in midden formation (Chapter V) we do not know.

The dates from Ke, although predominantly from shell samples, exhibit a very high degree of consistency in stratigraphical order as do the dates from Ogoloma.

There is a discrepancy between dates from the charcoal sample (UNN 0027) and shell sample (UNN 0028), both from the same level at Saikiripogu III; the inversion is perhaps as a result of the nature of the samples. However, the statistical margin of error for the charcoal sample (UNN 0027) is very high, making the range so wide as to be meaningless. Similarly the shell sample UNN 0028 must be used with caution until corrected (Olsson 1973).

In Okochiri some inversion seems to have occurred between samples UNN 0052 and UNN 0053, both from the same midden. A possible cause may be that the total charcoal sample UNN 0053 was made up of flakes from different levels between 147 and 300 cm although a substantial portion came from an old ground floor and the bulk from a lens of ash. Contamination was also possible at the time when these were put together almost one year after the excavation. There is also the possibility that the fragments forming the sample may have been shifted from a shallow to a deeper level in the course of the midden management (see Chapter V). However, the samples UNN 0500 and UNN 0055 agree.

If the dates are grouped by the period suggested previously, the following pattern in Table X.2 emerges.

There is therefore an interesting spread of dates over the last 1000 years which can be used to interpret material remains. This will be done in the next section but it may be noted:

(i) that since the data have all come from shell middens these seem to have been in use throughout the three periods (II-IV).

(ii) that at the end of Period II the earliest pottery is of a sophisticated range not far different from those of later period.

(iii) there seems to be use of the same sites by communities with the same ceramic traditions and economies for at least 1000 years.

3. Settlement of the Niger Delta

Prior to the 1973 excavations the reconstruction of early delta history has been undertaken by other disciplines. Very little is still known about the early history of any of the peoples of Nigeria. Although the coastal peoples had been partially documented during the last 300 years as a result of their contact with Europeans, those of the hinterland remained largely unknown until the 19th century. Much guesswork had dominated the superficial and often conflicting pre-20th century accounts and the problem of the origins of these peoples has proved insoluable by conventional historical and anthropological

Table X. 2 Chronological Pattern of the Settlement of the East Niger Delta Suggested by C14 Dates

| Period | Range | Site | C14 Dates |
|---|---|---|---|
| IV | 1500 A. D. to present | Ogoloma B | 1840 ± 75 |
| | | Ogoloma B | 1825 ± 75 |
| | | Onyoma I | 1750 ± 95 |
| | | Ke II | 1600 ± 105 |
| | | Onyoma I | 1605 ± 85 |
| | | Saikiripogu III | 1580 ± 60 |
| | | Onyoma II | 1505 ± 85 |
| III | 1000-1500 A. D. | Saikiripogu III | 1485 ± 125 |
| | | Onyoma I | 1460 ± 70 |
| | | Okochiri III | 1425 ± 90 |
| | | Saikiripogu I | 1405 ± 60 |
| | | Ogoloma A | 1345 ± 100 |
| | | Onyoma II | 1355 ± 100 |
| | | Okochiri III | 1225 ± 85 |
| | | Saikiripogu I | 1135 ± 125 |
| | | Ke III | 1185 ± 85 |
| | | Ke III | 1160 ± 80 |
| II | 1000 A. D. -2000 B. C. | Ke I | 985 ± 105 |
| | | Ke II | 970 ± 75 |
| | | Okochiri IV | 965 ± 85 |
| | | Okochiri I | 940 ± 80 |
| | | Ke I | 850 ± 80 |
| I | Before 2000 B. C. | | None |

methods. What appears germane to archaeological studies is the evidence of movements of populations, ideas and materials.

Oral tradition and linguistic studies combined with speculations (Talbot 1926; Smith 1929) suggest a series of past movements from central parts of Nigeria southwards giving rise to more local migrations into the delta. This invasion—population pressure succession and the suggested adjustment and response by further southward movement with each 'wave'—is said to account for the peopling of the Niger delta. It became rational to deduce from this that the peoples of the Niger delta represent the oldest inhabitants of eastern Nigeria. Forde has even compared the delta people to the refuge Celtic population of the Atlantic coasts of Europe. There seems little reason to see this tradition as being older than 1000 A.D.

One of the questions this project wished to answer was: when did the exploitation by man of the resources within the delta begin? This has probably not been answered for no sites of the postulated Period I (pre-2000 B.C.) or of most of Period II (2000 B.C. - 1000 A.D.) have been found although evidence from elsewhere in West Africa makes it likely that they will be. The evidence from the dated sites so far only extends to late in the first millennium A.D. This shows that Ke is at present the oldest settlement, beginning about the 9th century A.D. The evidence from Okochiri also suggests that at about the time the mangrove swamp sheltered creek site of Ke was being occupied, the mainland-coastal fringe zone of Okochiri was settled. Therefore we are in a position to talk of contemporary settlement with the 9th centrry finds from Igboukwu. Not only do they lack the sophisticated artistic expression but also the technology and socio-religious development that is manifested at Igboukwu. No evidence of contact has been found between the delta and Igboukwu at this period and none noted in the pottery. They may also be contrasted with a contemporary 9th century settlement at Nwankwo Bende; no evidence of contact between it and the delta has been noted.

Pre-2000 B.C.

While there is no evidence to confirm occupation of the delta at this time, inland there is dated occupation of the rock shelters in Afikpo by 2935 B.C. and Nsukka by 2555 B.C. (Hartle 1972, 1973). The communities' possession of pottery indicates some degree of technical elaboration and it could be that they were cultivating yams at this time. There is a considerable gap in both time and space between this evidence and that of the Niger delta and the region between them extending over 200 kilometres is still archaeologically unknown. The Afikpo and Nsukka communities were stone-using and were probably hunter-collectors. The exploitation of coastal resources is, of course, known to be much older in other parts of Africa, notably at Matje's River, South Africa, in the 6th millennium B.C. (Woodhouse 1971).

c. 2000 B.C. to c. A.D. 1000

Okochiri I, Okochiri IV and Ke I and Ke II give direct evidence of settlement within the delta within this period. In the saltwater zone, Ke I, the oldest of the dated middens belongs to the 9th century A.D. while midden Ke II appears to belong to the 9th or 10th century A.D. In saltwater-mainland fringe zone the Okochiri middens I and IV indicate that the site was in occupation

in the 9th or early 10th century A.D. One interesting observation is that the 9th century date from Okochiri IV is not associated with any shells but with pottery and fish bones. It is possible that economy of this community may not have included shell collection at this time.

All these sites were rich in pottery (Chapter IX) and the ceramic traditions represented can be seen to be of local origin. Although the abrasion of the pottery precludes a detailed assessment and comparison of the ceramic fabrics of the sites, on the forms present (Chapter IX) it can be said that within the sites themselves there is consistency in the variety of pottery materials, shapes and their decorative patterns and that Okochiri domestic utility pottery is very similar to that from Ke, especially the dishes and bowls. Ke is unique in the profuse occurrence of moulds and tuyère-like objects. There is no study of pottery from archaeological sites close to the delta to help us monitor any links with the north, the west or the east but there is no doubt that the two sites might have been affected from their northern Igbo neighbours but Igboukwu, the most sophisticated nearby inland example of cultural development in this period, does not appear to have influenced the delta on the present evidence. In Bende the Nwankwo site shows contemporaneous development by A.D. 805, but the loss of materials from the Nwankwo site prevented the study of any similarities.

A.D. 1000 to c. A.D. 1500

Five sites supply the evidence for this period. The sites of Okochiri and Ke continue to be occupied or re-occupied as indicated by Okochiri III and Ke III dates respectively. The pottery continues in the previous Okochiri tradition especially in the bowls. The saltwater/beach zone settlement of Saikiropogu I was occupied perhaps about the 12th century while Onyoma II in the middle Brass River was settled in the late 14th or early 15th century A.D. Onyoma pottery is in a class of its own with few decorations although these are more related to Saikiripogu than any other site. Close to Okochiri the island settlement of Ogoloma on the Bonny-Okrika river was occupied by the mid-14th century. The simple ceramic tradition of Okochiri is continued also at Ogoloma but there is an increase in the quantity of ceramic materials per unit area in the Ogoloma middens and before the end of this period Ogoloma pottery begins to show signs of sophisticated decorations and other surface treatment unknown at Okochiri. This trend can be attributed to wider influence in Ogoloma by distant trade centres. The Ogoloma midden is interesting in that it is the only one that shows continued use into the 19th century A.D. and contains direct evidence of participation in the overseas trade from the Atlantic.

This is a period of influence from further north. The reconstruction of this period of delta settlement had hitherto relied on oral tradition and although archaeology has begun to add some time dimensions to the period, its details are still not clear. Oral information collected by Alagoa (1972) suggests that a west to east movement added to the population of the eastern delta in this period; the initial movement is attributed to internal strife in the west delta societies.

What is clear from the literature is that by the end of this period there was continuous and large scale trading between the Niger delta and its western, eastern and northern hinterland nieghbours. This was observed by

Pachecho Pareira (1505-1508) who reported large scale trade by boat which brought down hinterland yams and livestock in exchange for delta fish and salt. Horton (1968) has referred to these early settlements as "fishing villages". We can therefore expect that exchange networks linked the delta to its neighbours, making it possible for people, materials and ideas to move in and out of the delta. It is possible that trade along the Niger introduced some Islamic influence into the delta but at present there is no evidence of this in this period.

Iron is known at Onyoma just before this period, although it seems to be earlier in Saikiripogu III showing close contact with the Iron working interior communities some 250 km north.

There is very little non-archaeological documentation for the Periods A.D. 1500-2000 B.C. The only study which might throw light on the end of the period is Alagoa's (1972) reconstruction through oral tradition of Ijo origins and migrations but these are in no way to be taken as representative of the origins of all the peoples (See Figure I.4) of the eastern delta. A point of interest in Alagoa's reconstruction is the recognition that autochtonous groups were in the east delta before the west-east migrations which he proposes. These autochtonous groups are said to have been conquered culturally (linguistically) by later incoming groups.

A.D. 1500 to Present

This period witnessed the most extensive recent movement of populations into and within the delta. The slave trade and its associated activities dominated the early part of this period and continued until the early 19th century. This period accounts for the transformation of some of the delta fishing villages into 'city states' (Dike 1956; Horton 1969). Alagoa (1970) has rightly argued that the political development within the delta at this time must be seen as the stabilization and maturity of a long process. Our analysis of the settlement chronology shows that the delta was equipped for the development of settlement hierarchies before the arrival of Europeans at the coast. Pereira (1505-08), Dapper (1636) and Barbot (1732) bear witness to this by their accounts of life in the delta in the early 16th and 17th centuries. There is no doubt, however, that the slave trade offered hinterland groups greater opportunity to dominate the delta which had become a 'frontier' full of opportunities in which loose social structures (Chapter IV) facilitated the absorption of individuals—slave or free—leading to the founding of new settlements and enlargement of old ones.

The earliest evidence among the four dated sites comes from the early 16th century (Onyoma II) and late 16th century (Saikiripogu III). There are signs of the socio-religious use of terracotta figurines which are known at Ke within this period; these are restricted to human models. In this period too the cowrie shell is known at Onyoma I as a burial gift and there is evidence for the use of chalk as body paint or in rituals. From the chalk-stained egg-shaped pottery of Saikiripogu III it may be inferred that chalk was in use from the beginning of the period and has continued till the present. The local use of cowrie is more for ornamental purposes than currency within the eastern delta.

The first two centuries of this period do not seem to show European influence in the material culture from Onyoma and Ke II. There are neither smoking pipes nor imported glazed ware, not even manillas. It is in Ke I that there is some manifestation of the wealth obtained from the European trade in the numerous manillae. In Ke I there is also evidence of imported glazed ware associated with the manillae and both European and local clay pipes were recovered from the same site. There is some link between the necked pottery of Ke and Saikiripogu with those of Ogoloma in this period. But Ogoloma pottery shows evidence of elaborate surface treatment absent from the other sites.

Ogoloma is the only site with dated evidence of settlement and use of the same midden in the 14th and the early 19th century. It also contains evidence of full participation in the Atlantic sea trade with the Europeans. Its list of artefacts is so varied and numerous as to confirm a series of contacts with areas far and wide. There are polished stones and iron objects associated in the same layers about the late 18th or early 19th centuries. Polished stone was also found on the surface of Ke I midden. Manillae are also recorded from succeeding layers as well as sword fragments and a 'copper' spiral anklet. We noted that stone outcrops of the nature to which the polished stone relates occur about 200 kms in the Okigwe-Nsukka plateau thus indicating contact and trade between these areas. Apart from the 'copper' spiral anklet which appears locally made, the other objects in copper (manilla and sword parts) are products of the Atlantic trade.

It is also only at Ogoloma that we have the known evidence of worked bone. The hunting of large terrestrial and marine mammals (see Table VIII.1) is a development based on the acquisition of fire-arms from the Atlantic trade. Similarly, it must be seen as indicating that Ogoloma was fully equipped to exploit the resources within its environment. However, the recovery of bones of domestic and semi-domestic animals such as dogs, sheep, goats, cows and cat from Ogoloma midden indicates trade networks from the interior both in the forest and savanna belts from where these were obtained. Pereira (1505) had observed this early trade in livestock from the hinterland into the delta.

The location of Ogoloma on the island of Okrika gave it a commanding position, mediating between the hinterland and the coastal delta and served as a transit point in the Atlantic trade (Cookey 1972; Ekejiuba 1972a, 1972b). The artefacts recovered from Ogoloma are self evident of the extent to which Ogoloma participated in the trade. There is factory-made glazed ware from the late 18th century in Ogoloma 1A and 1C. Glazed vessels do not occur in the other sites except at Ke. Their absence from some Period IV sites should not be interpreted to mean that they were unknown from these sites, but rather they were regarded as precious objects highly valued for prestige purposes, hence they become, like the manillae and other 'copper' objects, cherised for ritual and religious use and were stored away in shrines. It is in the same light that we must see the glass objects although they were recovered in situ at Ogoloma 1A and 1B, at Saikiripogu II, and on the surface at Okochiri; but gin and schnapps bottles are known from religious houses in these areas today. Another artefact which was in use in the Niger delta was the clay smoking pipe. These occur in levels just above that with a 14th century date

in Period III thus giving Ogoloma the earliest evidence for smoking on the West African coast. What is more, the Ogoloma smoking pipes shared marked morphological distinction from other West African examples (See Chapter VIII) and so stand at the head of a long series. It is interesting that Ogoloma type smoking pipes long preceded their associations with factory-made imported European smoking pipes in the 18th century when the local types were being gradually replaced by the European ones. Thus we have evidence of the independent practice of smoking in Ogoloma for two centuries before the European forms were accepted.

4. Evidence of Folk Movement

Although the direct dated evidence is still limited and tantalizing, some general observations about the direction of movement in the settlement of the Niger delta can still be made. In the Catchment Analysis in Chapter VII we recognized three territorial zones based on the rivers—Brass, Sombreiro-New Calabar and Okrika-Bonny; a fourth to which our study did not stretch is the Imo River. The radiocarbon dates seem to point out that the occupation of the delta may be fruitfully studied by the use of these broad territorial zones. The freshwater and mainland fringe zones north of these rivers must hold the key to questions about the settlement of the delta.

a) Movement from the West

The central delta west of the Niger is certainly an emmigration zone in Periods IV (Alagoa 1972) and probably III. It could well have been so earlier. The cultural borrowings and plitical domination of the western delta are particularly identifiable from 1500 A.D. onwards.

b) Movements from the North

Although there is no oral tradition of movements here, the archaeological evidence so far suggests north-south movements although it is in no way clear how far north the starting points may be sought. The earliest site, Ke, for example seems to have come into being as a result of movements along the Orashi-Engeni river from further north beyond the freshwater zone which is the source of the river. The site of Okochiri also supports a northern mainland influence as responsible for its initiation. Saikiripogu and Onyoma look towards the Brass River whether north of it in the freshwater zone or west of it in the central delta of Alagoa's division. The same evidence suggests the near contemporaneity of early settlement in the Sambreiro-New Calabar area and the mainland fringe and a later occupation of the Brass River area —separated in time by about four centuries.

c) Movement from the East

The limited archaeological record further east of Okochiri does not permit any stretching of the idea of movement from the east into the delta. However, it should be expected that the movement of people from the north along the Imo and Cross Rivers may have affected settlement of the east delta from a very early period.

5. Cultural Development

In discussing the cultural development of the eastern Niger delta two aspects are of especial interest here, a) the economy, and b) the material culture. Their interplay has given the delta much of its special qualities.

a) The economy

In some respects the mangrove and freshwater delta are uninviting zones (Chapter IV) especially in simple health and environmental terms and it may be wondered why the Niger delta was occupied at all. Hunters and collectors however well before the Holocene have been known to take advantage of salt and freshwater resources as long as they possess the necessary technology for their exploitation and it becomes obvious why the Niger delta was alraady occupied before 2000 years ago. The animal, fish and bird resources of the coast and the forests of the mainland fringe (Chapter VII) were incentives which would attract such groups. The Niger delta is, at present, the only African delta where relatively early and continued exploitation can be demonstrated.

Some delta resources, particularly shellfish and shallow water fish, require a minimal level of technology to exploit them and should have been easily amenable to the skill of any group. It is reasonable to suggest that the initial occupation of the saltwater delta must have been undertaken by groups already used to a water environment and this would have been possible from the coastal-mainland fringe or the seasonally flooded freshwater zones. This could well mean that the exploitation of the coastal and marine resources of different kinds had been in operation over some time, perhaps millennia, from a fringe zone even before the saltwater zone was occupied.

It is reasonable to infer that the occupation of the delta proper after c. 2000 B.C. must have taken place in stages like that of a 'frontier' zone (Alexander 1976). It is in such frontier situations that one must recognise the movement of peoples into different zones and the splitting up of kinship groups in the course of such movements or through decisions by groups or individuals to move further afield in the bid to take advantage of hitherto unexploited resource zones. The movements were unlikely to be accidental but systematic and well planned and may, as in the exploitation of fish, require some degree of seasonality and transhumance (Chapter VII). It should be no wonder that originally different groups should become mixed and that new communities should come into existence through intermarriage, residence and other blood bonds which broached their ethnic or linguistic differences. The loose social structure that this state of affairs engendered is still in evidence in the Niger delta today. However, as settlements stablised the tendency was for each to maintain its identity or share some with others to which it owed agnatic and other relationships. This phenomenon may possibly be recognized in the assessment of the pottery from earlier periods and can be suggested for the Ke, Onyoma and Ogoloma communities.

It is likely that there was always much communication between different groups and settlements although such communication was limited at the early periods to short distances. The territorial zones already considered will control these relationships, especially flow of goods, materials and ideas. The archaeological evidence offers no support for the invasion-population pressure hypothesis of Forde who saw the settlement of the delta in terms of strong groups from the north forcing the weaker ones into marginal zones. There is no evidence to validate the hypothesis, for neither have invading groups been identified nor possible causes of a postulated population explosion

nor even where it may have originated. The archaeological evidence suggests that it is proper to see the post-2000 B.C. settlement of the eastern delta as a peaceful, conscious series of movements from different points from the western delta and outside the delta, motivated by the desire to take advantage of the rich delta environment. If early settlement should be found it will be likely to belong to the ancient African coastal exploitation of the late Pleistocene and early Holocene.

Salt has for long been a staple commodity of inter-community trade all over Nigeria (Figure X.1). Early European visitors to the coast observed that trade connections between the delta and the north inland were highly organised by the 15th century. Large delta canoes traversed the delta from east to west and went up the River Niger as far north as the Benue-Niger confluence and through other inland rivers from whence they brought back livestock and yams in exchange for their salt and fish. Oral tradition collected by Alagoa (1970) shows that Bassan groups in the Escravos and the Nembe, manufactured salt by burning the red mangrove into ashes which were then put into baskets, strained with water and evaporated in large Itshekiri pots. The Itshekiri themselves who live in the west delta, with the Bassan and others of the Escarvos, also produced salt but from the white mangrove. Captain Hugh Crow (1830) observed "beautifully white salt of fine flavour" made at Bonny from green mangrove ashes which were burned in large brass pans imported from England. The city of Brass is said to have got its name from the importation of these pans used for salt manufacture by boiling saltwater. The importance of salt is emphasized by its entry into the local currency of exchange or accounting system by the late 18th century at Ughoton or the Benin River, in Bonny and by the mid-19th century at Aboh (Baikie 1856).

A number of sources for salt existed inland. Salt concentrated from saline spring water was obtained from Uburu in Afikpo, Mamfe in the Cameroons and in the middle Benue where extensive ancient industries formed the basis of a wide network of trade from the northeast corner of Nigeria. Salt was obtained from the ancient soda impregnated alluvium of Bornu. The exploitation of these sources no doubt reduced dependence on delta salt to the immediate hinterland groups. Thus the demand for salt should be expected to have been fairly satisfied before and during the early part of Period III after which European importation of this mineral must have adversely affected the local industry.

b) The material culture

As we noted above the 'culture' of the Niger delta is water based, with agriculture only in the mainland fringe and this affects the technology by which it is sustained. The effective occupation and utilization of any point in the intricate mangrove swamp environment criss-crossed by a maze of tidal creeks required the possession of some form of boat which the delta undoubtedly had before the 9th century A.D. The dug-out canoe as we know it was probably the single most effective tool in the conquest of the delta and therefore the vehicle by which people, ideas and materials moved from point to point and the main support of its prosperity.

As demonstrated in Chapters VIII and IX the delta in period IV has benefitted from the movement of agricultural products and raw materials as well

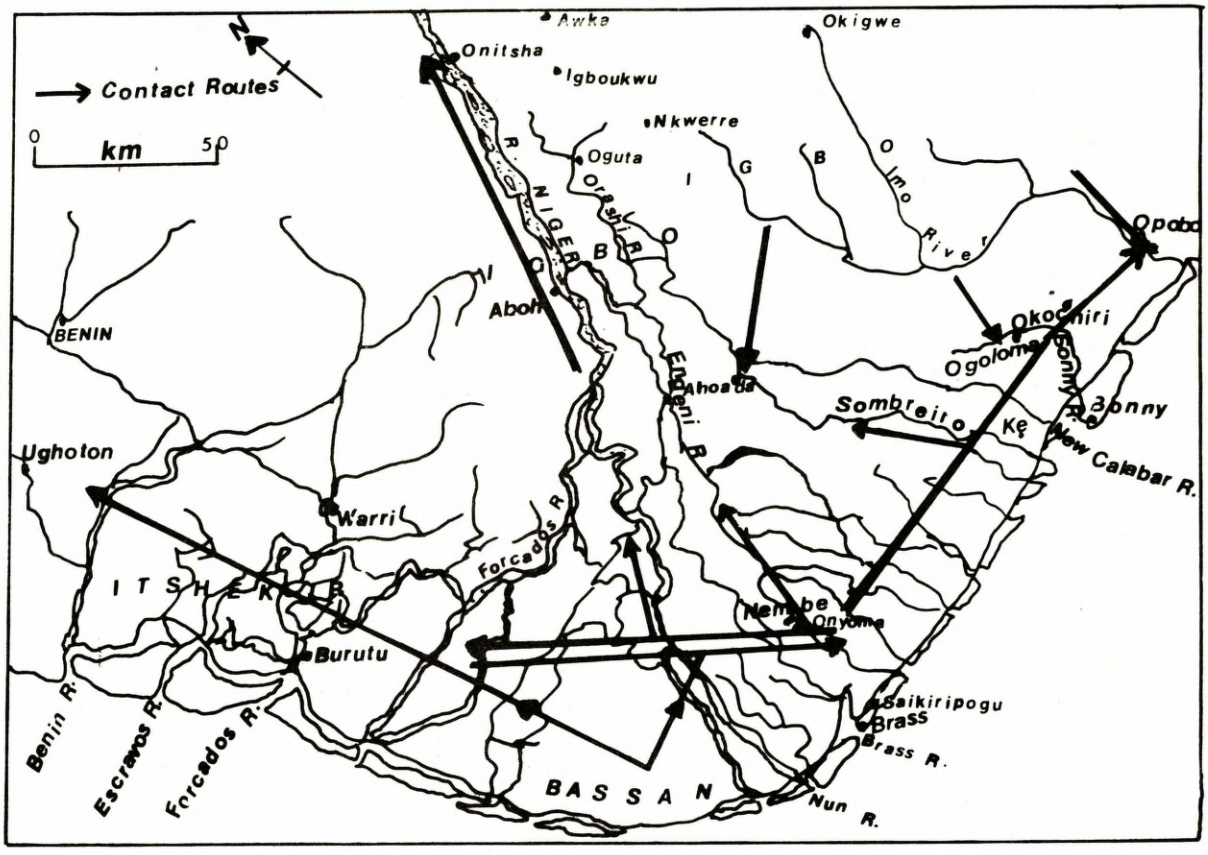



Figure X. 1 Trade Connections of the Niger Delta

as finished products, from their primary sources of exploitation and manufacture. These were in the form of 'gifts', 'reciprocity', 'exchange' or 'trade' as anthropologists refer to them in recent times. Three important materials should be mentioned: stone, iron and copper. The earliest evidence for the use of iron is from Ke about the 10th century. The point of interest here is not one of the time perspective but that stone and the metal (slag and artefacts) had found their way into the saltwater delta from a source some 250 km in the Nsukka-Udi range. It is however not until the 16th century that iron objects become part of the usual midden component though they were still few and far between. We have suggested (Chapter VIII) that the delta subsistence economy had little need for iron and this and its rarity accounts for its scarcity in the middens. The reworkings, recycling, and modification of old iron objects by itinerant blacksmiths in recent times seems in part to account for the absence of metal objects in the excavations.

The oldest object in copper so far recorded, a spiral coiled object, comes from Ogoloma 1A at the level some 40 cm above the A.D. 1345 $\pm$ 100 date. The use of copper ornaments is known about the same time at Onyoma. The manilla is of post-15th century type (Fig. VIII.5d). The socio-religious, political and aesthetic significance of objects in copper (Chapter VIII) confirms the place of copper as a 'Royal metal' in the Niger delta. It has also been suggested here that east of the Niger delta may be considered a possible source of the delta copper and should include the Cameroons and Central Africa as well as the copper mines of the Sahara. The Triton shell shaped bronze object from Igboukwu shows contact between Igboukwu and the delta. This shellfish is a delta species (Shaw 1976) which means that artists responsible for the Igboukwa bronzes were well acquainted with the mollusc by the 9th century A.D. It is, however, not clear what significane the molluscs had in Igboukwu of the time.

Worked bone is rare and so is worked shell and the explanation must not lie solely in terms of destruction alone since small fish bones were preserved in the excavations. Perhaps our limited scale of research may account for this situation. The only use made of shells was in the form of anklets of perforated Arca shells which were known from about the 11th century. Cakes of chalk made from ground and emulsified shells used for rituals and as body paint were recovered from Onyoma about the 14th century although chalk-stained thin-walled egg-shaped pots were in use at Ke much earlier.

Extensive use was made of clay from the end of Period II, the earliest period of delta settlement yet known. Although there are such utility clay objects as pots of different classes (Chapter IX), there are terracotta figurines (human, animal, fish, mask-models) from Ogoloma as early as the 13th century. They bear social, religious, economic and aesthetic relevance to the development of the delta groups. The archaeological evidence from Ogoloma suggests that local smoking pipes were in the Niger delta before the arrival of the first Europeans there. It is not clear whether this implies a knowledge of smoking before the introduction of tobacco from America. Perhaps we should begin to think of smoking as an activity quite independent of the knowledge , introduction and use of tobacco from America. However, further research of an anthropological nature is still needed before the issue can be put into proper perspective. Moulds and tuyère-like clay objects were in use

at Ke by the 10th century A.D. and at Saikiripogu by the 11th or 12th century but it is still not proved whether these represent some evidence of metal working. At Onyoma crucible-like objects are known from the late 16th century and although some of them bear green stains resembling those of oxidised copper, no copper objects, ores or slags were associated.

In conclusion it can be said that the occupation and early settlement of the delta was probably economically motivated and took place before the 9th century A.D. From that time at least several peripheral regions to the north and west were involved. The material culture suggests a close contact with its northern neighbours, a relationship presumably based from the start on the exchange of the salt and fish of the delta with the planted food crops, metal, and stone from the hinterland. There was however a strong and unbroken local succession from at least the 9th century. These interrelationships brought about the prosperity of the delta groups, the intermingling of peoples, ideas and materials which were the roots of the marine-oriented cultures that the first Europeans to the delta observed in the late 15th century. In the wake of European contact delta civilization from the 16th century developed through the consolidation and diversification of the existing characteristics some of which are in evidence today.

# BIBLIOGRAPHY


Adams, Capt. J. 1823 Remarks on the Country Extending from Cape Palmas to the River Congo. London.

Adeyoju, S. K. 1965 The Forest Resources of Nigeria, The Nigerian Geogr. J. VIII.

Afigbo, A. E. 1972 Trade and Trade Routes in 19th C. Nsukka, Paper read at the Hist. Soc. of Nigeria Congress, Lagos.

Agboola, S. A. 1967 Yam and Cassava in Western Nigeria: a study of change in an African food economy. Unpublished Ph.D. thesis, University of London.

Ahn, P. M. 1970 West African Soils, Oxford.

Alagoa, E. J. 1969 Oproza and Early Trade on the Escravos, J. Hist. Soc. Nig. 5(1).

Alagoa, E. J. 1970 Long Distance Trade and States in the Niger Delta, J.A.H. XI (3): 319-329.

Alagoa, E. J. 1972 A History of the Niger Delta: an historical interpretation of Ijo oral tradition. Ibadan.

Alagoa, E. J. 1974 Idu: a Creator festival at Okpoma (Brass) in the Niger Delta, Africa 34: 1-8.

Alagoa, E. J. 1974/75 Terracotta from the Niger Delta, Black Orpheus, vol. 3, nos. 2 and 3: 29-39.

Alagoa, E. J. 1975 Archaeological Survey of the Rivers State. Rivers Research Scheme: 1st Interim Report. Ibadan, pp. 1-16.

Alagoa, E. J. 1976 The Prehistory of the Niger Delta. Paper presented at the Conference of Niger Delta Studies, Sept, 9-11, Port Harcourt.

Alagoa, and Fombo 1972 A Chronicle of Grand Bonny. Ibadan University Press.

Alexander, J. 1970 The Directing of Archaeological Excavations. John Baker, London.

Alexander, J. 1977 The 'frontier' concept in prehistory: the end of the moving frontier, in Megaw, J.V.S. (ed.) Hunters, Gatherers and Farmers Beyond Europe: an Archaeological Survey, Leicester, pp. 25-40.

Alexander, J. and Coursey, D. G. 1969 The Origins of Yam Cultivation in P. J. Ucko and G. W. Dimbleby eds., The Domestication and Exploitation of Plants and Animals.

Allan, W. 1949 Studies of African Land Usage in N. Rhodesia. Rhodes-Livingstone Papers No. 15, London, OUP.

Allan, W. 1965 The African Husbandman. London/Edinburgh first published 1947.

Allen, J. R. L. 1964(a) The Nigerian continental margin bottom sediments, submarine and morphology and evolution, Marine Geol. 1(4): 289-332.

Allen, J. R. L. 1964(b) Sedimentation in the modern Delta of the River Niger, West Africa, Devs. in Sedimentology 1: 26-34.

Ambrose, W. 1963 (Sept.) Shell dump sampling, N.Z. Arch. Assoc. Newsletter 6,3: 155-158.

Ambrose, W. 1967 Archaeology and shell middens, Archaeol. and Physical Anthrop. in Oceania, 11(3): 169-186.

Andah, B. and Anozie, F. N. 1976 Preliminary Report on the Prehistoric Site of Afikpo (Nigeria), Paper presented to the Inaugural Session of West African Archaeol. Assoc. Enugn, December.

Anderson, A. J. 1973 (August) A Critical evaluation of the methodology of midden sampling, N.Z. Arch. Assn. Newsletter, 16,3: 119-127.

Anderson, D. R. 1975 Optimal, exploitation strategy for an animal population in a Markovian environment. A theory and an example, Ecology 51(16): 1281-1297.

Anderson, K. M. 1969 Ethnographic analogy and archaeological interpretation, Science 163: 133-138.

Anenechukwu, A. J. 1976 Traditional Pottery Making in Enugwu-Agidi. Unpublished B.A. thesis, Department of Fine and Applied Arts, University of Nigeria, Nsukka.

Anozie, F. N. 1973 Archaeological research in the Niger Delta, Oduma 1(1): 4-9, Port Harcourt.

Anozie, F. N. 1976a The Archaeology of the Niger Delta, Paper given at the University of Calabar Seminar.

Anozie, F. N. 1976b Excavations in Umundu: a Preliminary Report, Ms. Nsukka.

Anozie, F. N. 1976c Reflections on the Origins of West African Manillas, Paper read at the 1st Conference of West African Archaeological Association, Enugu, Dec.

Anozie, F. N. 1976d Excavations in Onyoma and Ke: a preliminary report. West Afr. J. Archaeol. 6.

Anozie, F. N. 1977 The Archaeology of Igboland, Paper read at Workshop on Igbo Language and Culture, Nsukka, April.

Ardrey, R. 1967 The Territorial Imperative, 7th impress. Fontana.

Ascher, R. 1959 A Prehistoric population estimate, using midden analysis and two population models, Southwestern J. Anthrop. 15: 168-178.

Ascher, R. 1961 Analogy in archaeological interpretation, Southwestern J. Anthrop. 17: 317-325.

Ascher, R. 1962 Ethnography for archaeology: a case from the Seri Indians, Ethnology 1: 360-369.

Avery, G. 1974 Open station shell midden sites and associated features from the Pearly Beach Area, Southwestern Cape, S. Afr. Archaeol. Bull. 29: 104-114.

Baikie, W. B. 1856 Narration of an Exploring Voyage up the River Kwora and the Binue commonly known as the Niger and Tsadda in 1854. London.

Bailey, G. N. 1975 Role of Shell Middens in Prehistoric Economies, Unpublished Ph.D. thesis, Cambridge.

Bannerman, n.d. Handbook of Birds of West and Equatorial Africa.

Barbot, J. 1732 A Description of the Coasts of North and South Guinea, Paris. Contains James Barbot: An Abstract of a Voyage to New Calabar River or Rio Real in 1699.

Basden, G. T. 1921 Among the Ibos of Southern Nigeria. London: Seeley Service.

Basden, G. T. 1966 Niger Ibos. 3rd ed. London. First published 1938.

Beals, A. R. 1964 Food is to Eat, American Anthrop. 66: 134-36.

Bender, A. E. 1968 Dictionary of Nutrition and Food Technology, 3rd ed. London, Butterworths.

Berrill, N. J. and Berrill, J. 1976 1001 Questions Answered about the Sea Shore (1st publ. 1957). New York, Dover Publ. Inc.

Biggs, E. J. 1969 Molluscs from Human Habitation and the Problem of Ethnological Interpretation, In Brothwell and Higgs, E.S. Science in Archaeology, London, Thames pp. 423-427

Binford, L. R. 1961 A New Method of calculating dates from kaolin pipestem samples, Hist. Site Arch. Paper, Ocumulgge Nat. Monument, Nov. 30.

Binford, L. R. 1967 Smudge pits and hide smoking: the use of analogy in archaeological reasoning, American Antiquity 32: 1-12.

Binford, L. R. 1968 Methodological considerations of the archaeological use of ethnographic data in Lee, R. B. and Devore, I. (eds.) Man the Hunter, pp. 68-273. Chicago.

Bishop, W. W. and Posnansky, M. 1960 Pleistocene environments and early man in Uganda, Uganda J. 24: 44-61.

Borgstrom, G. and Paris, C. D. 1965 The regional development of fisheries and fish processing, Fish as Food ed. G. Borgstrom, vol. III, Part I, pp. 301-409.

Breternitz, D. A. 1975 Rescue archaeology in the Kainji Reservoir Area 1968, W. Afr. J. Archaeol. 5: 91-151.

Buchanan, K. M. and Pugh, J. C. 1969 Land and People in Nigeria. London (first publ. 1955).

Buckle, C. 1978 Landforms in Africa: an introduction to Geomorphology. Longman.

Bunting, B. T. 1965 The Geography of Soils. Hutchinson University Library, London.

Burke, K., Dorotoye, A. B. and Whiteman, A. J. 1971 A dry phase south of the Sahara, 20,000 years ago, West Afr. J. Archaeol. 1: 1-8.

Burkill, I. H. 1938 The contact of the Portuguese with African food plants which gave words such as "yam" to European language, Proc. Linn. Soc. 150 (2) pp. 84-95.

Burkill, I. H. 1939 Notes on the genus Dioscorea in the Belgian Congo, Bull. Jard. bot. Etat, Brux. 15(4) 345-92.

Burkill, I. H. 1960 The Organography and evolution of the Dioscoreaceae, J. Linn. Soc. (Port) 56(367), pp. 319-412.

Burt, W. H. 1943 Territoriality and home range concepts as applied to mammals, J. Mammology 24: 346-352.

Butzer, K. 1964 Environment and Archaeology. Aldine, Chicago.

Campbell, J. M. 1968 Territoriality among ancient hunters: interpretations from ethnography and nature, Anthrop. Archaeology in America. Washington D.C. pp. 1-21.

Carpenter, K. J. 1969 Man's dietary needs. In Population and Food Supply (ed.) Sir Joseph Hutchinson. Cambridge pp. 61-74.

Carson, R. 1955 The Edge of the Sea. New American Library, N. York.

Carter, J. 1958 Erosion and sedimentation from aerial photographs: a micro-study from Nigeria, The J. of Trop. Geogr. XI: 100-106.

Chang, K. C. 1967 Major aspects of the interrelationships of archaeology and ethnology, Current Anthrop. 8: 227-243.

Chapman, J. D. 1969 Interactions between man and his resources, Resources and Man by National Academy of Sciences and National Research Council, pp. 31-42, San Francisco, Freeman and Co.

Chapman, U. J. 1975 Mangrove Vegetation. Cramer, Lehre.

Chapman, U. J. 1976 Coastal Vegetation. Oxford, Pergamon Press (2nd ed.).

Chevalier, A. 1936 Contribution to the study of some African species of the genus Dioscorea, Bull. Mus. Hist. Nat., Paris Serv. 27, 520.

Chevalier, A. 1946 Nouvelles recherches sur les ignames cultivees, Rev. Inter. Bot. Appl. 26, 279/280, pp. 26-31.

Chikwendu, V. E. 1977 Afikpo Excavations May-June 1975, unpublished Ph.D. thesis, University of Birmingham.

Chisholm, M. 1968 Rural Settlement and Land Use. London, Hutchinson, 2nd ed.

Clark, C. 1970 Starvation and Plenty. Secker and Warburg.

Clark, J. D. 1976 Prehistoric populations and pressures favouring plant domestication, Origins of African Plant Domestication (eds.) Harlan, de Wet and Stemler pp. 67-105.

Clark, J. G. D. 1952 Prehistoric Europe: the Economic Basis. London.

Clark, J. G. D. 1953 (1972) The Economic Approach to Prehistory. Or repr. in Leone, Mark. P. (ed.) Contemporary Archaeology: a Guide to Theory and Contributions. Carbondale, S.III.U.Press, pp. 62-77.

Clarke, D. L. 1962 Matrix analysis and archaeology with reference to Br. Beaker Pottery, PPS, new series, vol. XXVIII, No. 15, pp. 371-382.

Clarke, D. L. 1968 Analytical Archaeology. London.

Clayton, J. M. 1974 Seashells. London, Octopus Books.

Coe, M. D. and Flannery, K. U. 1964 Microenvironments and Mesoamerican prehistory, Science 143: 650-654.

Colonial Office 1957 The Indigenous Cattle of the British Dependent Territories in Africa. London.

Conklin, H. C. 1961 The Study of shifting cultivation, Curr. Anthrop., vol. 2, No. 1, 27-59.

Connah, G. 1975 The Archaeology of Benin. Oxford.

Cook, S. F. 1946 A reconsideration of shell mounds with respect to population and nutrition, American Antiquity 12, 1: 50-53.

Cook, S. F. 1950 Physical Analysis as a method for investigating prehistoric habitation sites, Reports California Archy. Survey No. I.

Cook, S. F. 1972 Prehistoric Demography. A McCaleb Module in anthropology from the series Addison-Wesley Modular Publs. Module 16: 1-42.

Cook, S. F. and Heizer, R. F. 1951 The physical analysis of Nine Indian mounds of the Lower Sacremento Valley, University of California Publs. in American Archy. and Ethnology, vol. 40: 281-312.

Cook, S. F. and Heizer, R. F. 1965 The Quantitative Approach to the Relation between Population and Settlement Size, Univ. Calif. Archaeol. Res. Facility 64.

Cook, S. F. and Treganza, A. E. 1947 The quantitative investigation of aboriginal sites: comparative physical and chemical analysis of two California Indian mounds, Am. Antiquity 13, 2: 135-141.

Cook, S. F. and Treganza, E. E. 1950 The quantitative investigation of Indian mounds, University of Calif. public. in Am. Archy. and Ethnology, vol. 40: 223-262.

Cookey, S. J. S. 1972 An Igbo Slave Story of the Late 19th Century and its Implications, IKENGA 1(2): 1-8, Nsukka.

Coursey, D. G. 1965 The role of yams in W. African food economies, World Crops 17(2), pp. 74-82.

Coursey, D. G. 1967 Yams. London.

Coursey, D. G. 1976 The origins and domestication of yams in Africa in Origins of African Plant Domestication, eds. Harlan et al. pp. 383-408.

Coursey, D. G. and Coursey, C. K. 1971 The new yam festivals of W. Africa, Anthropos, 66, pp. 444-484.

Coutts, P. J. F. 1970 Bivalve-growth patterning as a method for seasonal dating in archaeology, Nature. London 226, 874.

Coutts, P. J. F. 1972 (August) An approach to excavating and analysing large quantities of archaeological data, N.Z. Archy. Assn. Newsletter 15 (3): 81-88.

Coutts, P. and Higham, C. 1971 The seasonal factor in prehistoric New Zealand, World Archaeology, Vol. 2, 266-277.

Cowgill, G. L. 1971 Computers and prehistoric Archaeology in Man's Imprint from the Past (ed.) Deetz, J. Boston, Little, Brown and Co.

Crow, Capt. H. 1830 Memoirs of the Late Captain Hugh Crow of Liverpool. London, Frank Cass.

Dalziel, J. M. 1937 The Useful Plants of West Tropical Africa, Crown Agents, London.

Dance, S. P. 1971 Seashells. London, Hamlyn.

Dapper, O. 1666 Description d'Afrique. London.

Davidson, J. M. 1964a (March) Concentrated shell middens, N.Z. Arch. Assn. Newsletter 7, 2: 70-78.

Davidson, J. M. 1946b (Dec.) Processing and analyzing midden samples, New Zealand Arch. Ass. Newsletter, 7, 4: 152-163.

De Candole, A. 1886 The Origins of Cultivated Plants. Reprinted Hafner, N.Y. 1939.

De Cardi, C. N. 1899 Natives of the Niger coast protectorate, an appendix in Mary Kingsley's West Afr. Studies. London 1899.

D'hore, J. 1960 La carte des sols d'Afrique au sud du Sahara, Pedologie X (1) (quoted in Ofomata 1977).

Diem, K. (ed.) 1962 Documenta Geigy, Scientific Tables 6th ed. Macclesfield, Cheshire, Geigy (UK) Ltd., Pharmaceuticals Division.

Dike, K. O. 1956 Trade and Politics in the Niger Delta. Oxford.

Dozier, E. P. 1970 Making inferences from present to past, in Reconstructing Prehistoric Pueblo Societies (ed.) W. A. Longacre, Albuquerque, University Mexico Press, pp. 202-213.

Dalton, G. 1961 Economic theory and primitive society, Am. Anthrop. 63: 1-25.

Ekejiuba, F. I. 1967 Preliminary notes on brasswork of Eastern Nigeria, African Notes 4(2): 11-15.

Ekejiuba, F. I. 1972 a & b The Aro trade system in the 19th C. Ikenga. Nsukka. a) 1(1): 11-26, b) 1(2): 10-21.

Elouard, P. 1969 L'homme du Nouakchottien, Notes Africain, Dakar, 121: 8-10.

Eluyemi, O. 1975 Tobacco Pipes excavated at Isoya (Ife), Ikenga, vol. 3, Nos. 1 and 2, pp. 108-118.

Fagg, B. B. 1946 Archaeological notes from Northern Nigeria, Man 48.

Fitzhugh, W. W. 1972 Environmental archaeology and cultural systems in Hamilton Inlet, Labrador: a survey of the central Labrador Coast from 3000 B.C. to the present. Smithsonian Contributions to Anthropology No. 16, Washington, Smithsonian Institution Press.

Flint, R. F. 1959 Pleistocene climates in eastern and southern Africa, Bull. of the Geol. Soc. America 70: 343-374.

Floyd, B. 1969 Eastern Nigeria: a Geographical Review. Macmillan, London.

FAO 1963 Third World Food Survey, Freedom from Hunger Campaign Basic Study No. 11. Rome.

Forde, D. and Jones, G. I. 1950 The Ibo and Ibibio-Speaking Peoples of Southeastern Nigeria. London Int. African Inst.

Galletti, R., Baldwin, K. D. S. and Dina, I. O. 1956 Nigerian Cocoa Farmers. Nigeria Cocoa Marketing Bd., London.

Gifford, E. W. 1916 Composition of California shellmounds, Berkeley, Univ. of California Publications in American Archaeology and Ethnology 12: 1-29.

Gifford, E. W. 1949 Diet and the age of Californian shellmounds, Am. Antiquity 14: 223-224.

Glassow, M. A. 1967 Considerations in estimating prehistoric California populations, Am. Antiq. 32(3): 354-359.

Gray, R. 1962 A report on the conference, Third Conference on Afr. Hist. and Archaeol., J. Afr. Hist. 3(2): 195-209.

Greengo, R. E. 1951 Molluscan species in California shell middens, Reports, University of California Archy. Survey, No. 13.

Greenwood, R. E. 1961 Quantitative analysis of shells from a site in Goleat California, Am. Antiquity, 56: 416-420.

Grigg, D. 1973 Geographical studies of economic development with special reference to agriculture, in Studies in Human Geography (ed.) M. Chisholm and B. Rodgers. London, Heinemann, pp. 18-84.

Grove, A. T. 1951 Land use & soil conservation in parts of Onitsha and Owerri Provinces, Bull. 21, Geological Survey of Nigeria.

Gullard, J. A. 1975 Ecological aspects of fishing research in Advances in Ecological Research (ed.) J. B. Cragg. Academic Press, N. York, 115-176.

Hanson, L. H. 1971 Kaolin pipe-stems-boring on a fallacy, The Conference on Hist. Sites Archaeology Papers 1969 4: 2-15.

Harlan, J. R., De Wet, J. M. J. and Stemler, A. B. (eds.) Origins of African Plant Domestication. Mouton Publishers, The Hague, in World Anthrop. Series ed. Sol Tax.

Harris, D. R. 1969 Agricultural systems, ecosystems and the origins of agriculture, in Ucko, P. J. and Dimbleby, G. W. (eds.) The Domestication and Exploitation of Plants and Animals, Duckworth, London, pp. 3-15.

Harris, D. R. 1972 Swidden systems and settlements, in Man, Settlement and Urbanism. P. J. Ucko, R. Tringham and G. W. Dimbleby (eds.). London, Duckworth, pp. 245-262.

Harris, D. R. 1973 The prehistory of tropical agriculture: an ethnoecological model, in Renfrew, C. (ed.) The Explanation of Culture Change: Models in Prehistory. Duckworth, London, pp. 391-417.

Harris, D. R. 1976 Traditional systems of plant food production and the origins of agriculture in W. Africa, in Harlan, J. R. (ed.) The Origins of African Plant Domestication. Mouton Publ., The Hague, pp. 311-356.

Hartle, D. D. 1965 An Archaeological Survey in Eastern Nigeria, West Afr. Archaeol. Newsletter 2: 4-5, Ibadan.

Hartle, D. D. 1966. Bronze Objects from Ezira, Eastern Nigeria, West Afr. Archaeol. Newsletter 4: 25-28, Ibadan.

Hartle, D. D. 1967. Archaeology in Eastern Nigeria, Nigeria Magazine, No. 93, Lagos.

Hartle, D. D. 1968. Stop Press, Radiocarbon Dates, West Afr. Archaeol. Newsletter 9.

Hartle, D. D. 1972. Archaeology East of the Niger, ms Nsukka.

Hartle, D. D. 1973. The Making of our Nation - The Prehistory of Nigeria, ms Msukka. (A series of radio lectures for the Nigeria Broadcasting Corporation).

Heider, K. G. 1968. Archaeological assumptions and ethnographic facts: a cautionary tale from New Guinea, Southwestern J. Anthrop 23: 52-64.

Heider, K. G. 1972. Environment, subsistence and society, Annual Rev. of Anthropology I: 179-206.

Helsop, I. R. P., 1935. Report on the Vertebrate Fauna of the Owerri Provance of Nigeria. Prepared for the Society for Preservation of Fauna of the Empire.

Higgs, E. S. (ed.) 1972. Papers in Economic Prehistory. Cambridge.

Higgs, E. S. (ed.) 1975. Palaeoeconomy. Cambridge.

Higgs, E. S. 1976. Archaeology and domestication;in Origins of African Plant Domestication (eds.) Harlan et al. Mouton Publ., The Hague, pp. 29-39.

Higgs, E. S. and Vita-Finzi, C. 1972. Prehistoric economies: a territorial approach, in Papers in Economic Prehistory, ed. Higgs, E. S. Cambridge.

Hill, D. 1957. The origins of West African cattle, Ibadan No. 1. (Quoted in C. Wrigley 1970, p. 70 footnote.)

Hole, F. and Heizer, R. F. 1973. An Introduction to Prehistoric Archaeology. Holt Rinehart and Winston Inc. N.Y. First publ. 1965.

Hole, F. 1973. Questions of theory in the explanation of culture change in prehistory in The Explanation of Culture Change. Models in Prehistory. Renfrew, C. (ed.), London, Duckworth, pp. 19-34.

Hornell, J. 1950. Fishing in Many Waters. Cambridge.

Horton, R. 1965. A note on recent finds of brasswork in the Niger Delta, Odu (Ibadan) III (1): 76-91.

Horton, R. 1969. From fishing village to city state. The social history of New Calabar, in Mary Douglas and Phyllis M. Kaberry (eds.) Man in Africa 1969, London, Tavistock Publs. p. 37-58.

House, M. R. and Farrow, G. E. 1968. Daily growth banding in the shell of the cockle Cardium edule, Nature 219: 1384-6, London.

Howat, G. R. 1945. Variations in the composition of the sea in West African waters, Nature 155: 415-417.

Hutchinson, H. T. 1861. Ten Years of Wandering among the Ethiopians. Republ. by Cass in 1967.

Irvine, F. R. 1949. Indigenous food plants of West Africa, Economic Botany 3: 441-442.

Irvine, F. R. 1952. Supplementary and emergency food plants of West Africa, Economic Bot. 6(1): 23-40.

Jarman, M., Vita-Finzi, C. and Higgs, E. S. 1972. Site catchment analysis in Archaeology,in Man, Settlement and Urbanism (eds.) P. J. Ucko, R. Tringham, G. W. Dimbleby. London, Duckworth.

Jeffreys, M. D. W. 1938. The cowry shell: a study of its history and use in Nigeria, Nigeria, No. 14, pp. 211-226, 256.

Jeffreys, M. D. W. 1947. (June) Ogoni Pottery, a note, Man 47 (4): 81-3.

Jeffreys, M. D. W. 1955. Columbus and the introduction of Maize into Spain, Anthropos 50, pp. 427-432.

Jeffreys, M. D. W. 1957. The origin of the Portuguese word zuburro as their name for maize, BIFAN (Dakar) Ser. B.

Jeffreys, M. D. W. 1971. (June) Maize and the Mande myth, Current Anthropology, vol. 12, no. 3, 291-320.

Jochim, M. A. 1976. Hunter-Gatherer Subsistence and Settlement: a Predicative Model. New York, Academic Press.

Johnson, G. A. 1977. Aspects of regional analysis in Archaeology, Annual Rev. Anthrop. 6: 479-508.

Johnson, B. F. 1958. The Staple Food Economies of West Tropical Africa. Stanford Univ. Press.

Johnston, H. H. 1888. The Niger Delta, Proc. Roy. Geogr. Soc., vol. 10.

Jones, G. I. 1958. Native and trade currencies in Southern Nigeria during the eighteenth and nineteenth centuries, Africa 28, 1958: 43-54.

Jones, G. I. 1963. Trading States of the Oil Rivers.

Jones, W. O. 1959. Manioc in Africa. Stanford Univ. Press, California.

Joy, L. 1967. One economist's view of the relationship between economics and anthropology, in Themes in Economic Anthropology, (ed.) R. Firth. London, Tavistock, pp. 29-46.

Jungerius, P. O. 1964. The soils of Eastern Nigeria, Publ. van Let Fysisch-Geografisch Laboratorium van de Universitiet van Amsterdam IV.

Karmon, Y. 1966. A geography of settlement in Eastern Nigeria, Studies in Geography, vol. XV, Pamphlet No. 2. Publications of the Hebrew Univ. of Jerusalem.

Karberry, P. 1952 Women of the Grasslands. Colonial Office, Colonial Research Publ. 14, London.

Keay, R. W. J. and Onochie, C. F. 1947. Some observation on the Sobo Plains, Farm and Forest (Nigeria) 8.

Keay, R. W. 1949. An outline of Nigerian vegetation, 1st ed. 1953, 2nd ed. Government Printer, Lagos, Revd. by Rosevear, D. R. 1955 (Niger. Fld. 20(4).

Keay, R. W. J. 1959. Derived savanna-derived from what?, Bull. de l'IFAN, 21, series A: 427-438.

Keys, 1949 Nutrition Abstract Review 19, quoted in Nicol 1952.

Kingsley, M. H. 1899. Travels in West Africa. 3rd ed. Frank Cass, London.

Knudsen, J. 1946. Egg capsules and development of some marine prosobranchs from tropical West Africa, Atlantide Report, No. 1, p. 85-130, Copenhagen 1950.

Knudsen, J. 1956. Marine prosobranchs of tropical West Africa (Stenoglossa), Atlantide Report 4: 9-110.

Knudson, S. J. 1978. Culture in Retrospect: an Introduction to Archaeology. Chicago, Rand McNally College Publ. Co.

Koike, H. 1973. Daily growth lines of the clam Meretrix Insoria: a basic study for the estimation of prehistoric seasonal gathering, J. Anthropol. Soc. Nippon 81(2): 122-38.

Lander, R. and Lander, J. 1832. Journal of an Expedition to Explore the Course and Terminations of the Niger. London.

Lawton, J. H. 1973. The enegery cost of "food-gathering". In B. Benjamin, P. R. Cox and J. Peel (eds.) Resources and Population. London: Academic Press.

Lebeuf, J. P. 1962. Archaeologie tchadienne: les Sao du Cameroun et du Tchad. Paris.

Lee, R. B. 1968. What hunters do for a living, in Lee, R. B. and Irven De Vore (eds.) Man the Hunter. Chicago, Aldine Publ. Co. pp. 30-48.

Leis, P. 1962. Enculturation and Cultural Change in an Ijaw Community (Korokorosei). Unpubl. Ph.D. thesis, Northwestern University.

Leith-Ross, S. 1970. Nigerian Pottery. Nigerian Museum, Lagos.

Leonard, A. G. 1906. The Lower Niger and its Tribes. London.

Lewis, J. R. 1961. The littoral zone on rocky shore - a biological or physical entity, Oikos, Fasc. 11 (2): 280-301.

Linares de Sapir, O. 1971. Shell middens of Lower Casamance and problems of Diola protohistory, WAJA I: 23-54.

Lovejoy, W. F. and Homan, P. T. 1965. Methods of estimating resources of crude oil, natural gas and natural gas liquid, in Resources for the Future. Balitmore, John Hopkins.

MacCance, R. A. and Widdowson, E. M. 1960. The Composition of Foods. Special Report Series of the Med. Res. Council, No. 297. London, H.M.S.O.

MacLaren, P. R. 1954. Nigerian fishes and their palatability, The Nig. Fld. XIX (1): 4-15.

MacNeish, R. S. 1967a. An interdisciplinary approach to an archaeological problem, in The Prehistory of the Tehuacan Valley: Vol. I, Environment and Subsistence, (ed.) D. S. Byers, Austin, University of Texas Press: 14-24.

MacNeish, R. S. 1967b. A Summary of subsistence, in D. S. Byers (ed.).

Madsen , A. P., Muller, S., Neergaard, C., Petersen, C. G. J., Rostrup, E., Steenstrup, K. J. U. and Winge, H., 1900. Affaldynger fra Stenalderen i Danmark. Copenhagen, C. A. Reitzel.

Maggs, T. and Speed, E., 1967. Bonteberg Shelter, South Afr. Archaeol. Bull. 22(87): 80-93.

Mauny, R. 1973. Datation au carbone 14 d'amas artificiels de coquillages des lagunes de Basse Cote-d'Ivoire, W. Afr. J. Archaeol. 3: 207-14.

McBurney, C. B. M. 1967. The Haua Fteah. Cambridge.

McMillan, R. B. 1976. Biophysical change and cultural adaptation at Rodgers Shelters, Missouri. Ph.D. dissertation, Dept. of Anthropology, Univ. of Colorado, Boulder, U.S.A.

Meek, C. K. 1937. Law and Authority in a Nigeria Tribe. London, OUP.

Meighan, C. 1953. Ancient pottery figurines and their significance in the study of prehistory. Unpubl. Ph.D. thesis in Anthrop., University of California.

Meighan, C. W. et al. 1958. Ecological interpretation in Archaeology: parts I and II, Am. Antiquity, 24: 2-23, 131-150.

Meighan, C. W. 1969. Molluscs as food remains in archaeological sites, in Brothwell and Higgs (eds.) Science in Archaeology. London, pp. 415-422.

Meige, J. 1952. L'importance economique des ignames en Cote d'Ivoire, Rev. int. Bot. appl. Agric. trop. 32 (353-4), 144-55.

Meige, J. 1954. Les cultures vivrieres en Afrique Occidentale, Cah. d'Outre-Mer, 7 (25), 25-50.

Min. of Agric. 1958. Agriculture Department Report 1957/58. Enugu. Govt. Printer.

Monkhouse, R. A. 1966. The Geology of Eastern Nigiera. Nsukka.

Morgan, W. B. 1955. Farming practice, settlement pattern and pop. density in S. Eastern Nigeria, Geog. Journal, 121, 320-33.

Murdock, G. P. 1949. Social Structure. New York, The Free Press.

Murdock, G. P. 1959. Africa: Its Peoples and their Culture History. McGraw Hill, N.Y.

Murdock, G. P. 1957. Ethnographic atlas: a summary, Ethnology 6 (2).

Murrat, P. C. 1970. Stratigraphy and palaeogeography of the Cretaceous and Lower Tertiary in Southern Nigeria, Proc. 1st Conference on Afr. Geology, Ibadan.

Murray, A. B. 1973. Seashell Collectors Handbook and Identification. New York, Sterling Publ. Co. Inc.

N.R.C. (USA) 1948. Report of the National Res. Council, Washington, No. 2.

Neaher, N. C. 1976. Bronzes of Southern Nigeria and Igbo metal smithing traditions. Unpubl. Ph.D. thesis, Stanford University.

Nedeco, 1959. River Studies and Recommendations on Improvement of Niger and Benue. Amsterdam, Netherland Engr. Dev. Co.

Nedeco, 1961. Waters of the Niger Delta: Report on Investigation. The Hague.

Nelson, H. D. et al. 1972. Area Handbook for Nigeria. Washington.

Nickles, M. 1955. Scaphopodes et Lammellibranches recoltes dan l'Ouest Africain, Atlantide Report No. 3: 93-237, Copenhagen.

Nicol, B. M. 1952. The nutrition of Nigerian peasant farmers, Brit. J. Nutrition, 6 (1): 34-55.

Nicol, B. M. 1954. A Report of the Nutritional Work which has been carried out in Nigeria since 1920, with a Summary of what is known of the present Nutritional State of Nigerian Peasants. Nigeria E. Region. Min. Health, Enugu.

Novelli, U. A-L. 1974. Outlines of Niger Delta Geology. Paper read at Well Evaluation Conference (Nigeria, Port Harcourt), April 1974: 1-2 (map).

Nzewunwa, N. 1976. Eastern Nigeria Subsistence Economics in Literature: an incursion into Economic Prehistory, Paper presented to the Inaugural Conf. of West Afr. Archaeol. Assoc., Enugu, Nigeria (Dec. 1976).

Nzewunwa, N. 1978. Shell midden excavations in Nigeria, Nyame Akuma, A Newsletter of Afr. Archaeol. No. 13: 23.

Nzewunwa, N. 1979. Aspects of economy and culture in the Prehistory of the Niger Delta. Unpublished Ph.D. thesis, Univ. of Cambridge.

Obihara, C. H. 1961. The acid sands of Eastern Nigiera, Nigerian Scientist I: 57-64.

Odum, E. 1971. Fundamentals of Ecology. 3rd ed. Philadelphia, W. B. Saunders.

Ofomata, G. E. K. 1973. Aspects of the geomorphology of the Nsukka-Okigwe Cuesta, East Central State of Nigeria, Bull. de l'IFAN Serie A, vol. XXXV: 459-501.

Ofomata, G. E. K. 1976a. Port Harcourt-Aba Complex: A Geographical Study. Nsukka.

Ofomata, G. E. K. 1976b. Some observations on relief and erosion in Eastern Nigeria, Revue Geomorphologie Dynamique vol. XVII: 21-29.

Ofomata, G. E. K. 1975. Nigeria in Maps: Eastern States. Ethiope Publishing House, Benin City.

Ofomata, G. E. K. 1977. Environmental Basis of Igbo Culture, Paper read at Workshop on Igbo language and culture, Nsukka, April 1977.

Okiy, G. E. O. 1960. Indigenous Nigerian food plants, J. W. Afr. Sc. Assoc. 6 (2): 117-21.

Olsson, I. U. 1973. The radiocarbon dating of Ivory Coast shell mounds, West Afr. J. Archaeol. 3: 215-220.

Onwuejeogwu, M. A. A Brief Survey of an Anambra Civilization in the Igbo Culture Area A.D. 866-1937, Tabansi Press Oritsha.

Onwuejeogwu, M. A. 1974. The Political Organisation of Nri Southeastern Nigeria, Unpublished M. Phil. thesis, University of London.

Onwuejeogwu, M. A. and Onwuejeogwu, B. A. 1976. The search for the missing links in dating and interpreting the Igboukwu finds, J. of Odinani Museum, No. III, Inst. of Afr. Studies, Ibadan.

Orton, J. H. 1923. On the significance of rings on the shells of Cardium and other molluscs, Nature, London, 112, 10.

Osmond, A. and Wilson, W. 1961. Tables of Composition of Australian Foods. Commonwealth Dept. of Health, Canberra.

Oswald, A. 1975. Clay pipes for the archaeologist, Brit. Arch , Reports 14.

Otedoh, M. O. 1974. The King Raphia palms of the Niger Delta, The Nig. Field XXXIX (4) Dec.

Ozanne, P. C. 1964. Excavations at Ladoku: a preliminary report, W. Afr. Archaeol. Newsletter 1: 8-10.

Ozanne, P. C. 1969. The diffusion of smoking in West Africa, Odu: J. Yoruba Studies (N. S.) 1(2): 29-42.

Parkinton, J. E. 1976. Follow the Sun: an Analysis of Seasonality in the Prehistory of the Southwestern Cape. Unpubl. Ph.D. thesis, Cambridge University.

Pelzer, K. J. 1957. Land utilization on the humid tropics: Agriculture, Proc. Pacific Sc. Assoc., Vol. 20, pp. 74-81.

Pereira, P. O. 1505-8. Emeraldo de Situ Orbis. Reprinted in English by the Hakluyt Soc., London, 1937. Trans. G. H. T. Kimble.

Pirie, N. W. 1976. Food Resources. 2nd ed. London, Penguin.

Portères, P. 1955. L'introduction du mais en Afrique, J. Agr. Trop. et de Bot. Applique, Paris, pp. 221-231.

Pugh, J. C. 1961 (Dec.). River captures in Nigeria, The Nigerian Geogr. J. IV.

Purseglove, J. W. 1972. Tropical Crops: Monocotyledons. 2 vols. London, Longmans.

Purseglove, J. W. 1976. Origins and migrations of crops in Tropical Africa, in Origins of African Plant Domestication, (eds.) Harlan et al. Mouton, The Hague, pp. 291-309.

Ragir, S. 1972. A review of techniques for archaeological sampling, Leone Mark P. (ed.) Contemporary Archaeology Carbondale S. I11. Univ. Press and London, Feffer & Sons Ltd., 187-97.

Reyment, R. A. 1965. Aspects of the Geology of Nigeria. Ibadan.

Richards, P. W. 1961. The types of vegetation of the humid tropics in relation to the soil, published under title 'Tropical soils and vegetation', Proc. of the Abidjan Symposium, Paris 1961, UNESCO, 15-23.

Ricketts, E. K. and Calvin, J. 1948. Between Pacific Tides. Stanford University Press.

Rosevear, D. R. 1947. Mangrove swamps, Farm and Forest, Vol. VIII, No. 1: 23-30.

Rosevear, D. R. 1953. Checklist and Atlas of Nigerian Mammals. Lagos.

Ryder, A. 1972. Benin and the Europeans. Longman.

Sahlins, W. D. 1971. The intensity of domestic production in primitive societies: social inflections of the Chayahoo slope, Studies in Economic Anthropolgoy (ed.) G. Dalton: 30-51.

St. Joseph, J. K. S. 1966. The Uses of Air Photography. London, Baker.

Seddon, 1968. The origins and development of agriculture in East and Southern Africa, Current Anthrop. 10 (5): 524-525.

Servant, M. and Servant, S. 1972. Nouvelles donnes pour une interpretation paleoclimatique de series continental du basin Tchadien (Pleistocene, recent Holocene), in Palaeoecology of Africa, (ed.) Van Bakker, Balkena, Cape Town.

Service, E. R. 1966. The Hunters. New Jersey, Prentice Hall Inc.

Shackleton, N. J. 1969. Marine mollusca in Archaeology, in D. R. Brothwell and E. S. Higgs (eds.), Science in Archaeology, 407-44.

Shackleton, N. J. 1973. Oxygen isotope analysis as a means of determining season of occupation of prehistoric midden sites, Archaeometry 15: 133-141.

Shaw, T. 1960. Early smoking pipes in Africa, Europe and America, J. Roy. Anthrop. Inst. 90, Pt. 2.

Shaw, T. 1970. Igbo-ukwu: an Account of Archaeological Discoveries in Eastern Nigeria. 2 vols. Faber and Faber Ltd.

Shaw, T. 1976. Early crops in Africa: a review of the evidence, in Harlan, J. R. et al. (ed.) The Origins of African Plant Domestication. Mouton Publishers, The Hague, pp. 107-153.

Shaw, T. 1977. Unearthing Igboukwu. OUP Ibadan.

Shaw, T. 1978. Nigeria: its Archaeology and Early History. Thames and Hudson, London.

Shawcross, W. 1967. An investigation of prehistoric diet and economy on a coastal site at Galatea Bay, New Zealand, P. P. S. 7: 107-131.

Shawcross, W. 1970. Ethnographic economics and the study of population in prehistoric New Zealand: view through Archaeology, Mankind 7: 279-291.

Shepard, A. O. 1976. Ceramics for the Archaeologist. Carnegie Inst. of Washington, Washington D.C., first publ. 1956.

Sherrat, A. G. 1972. Socioeconomic and demographic models for the Neolithic and Bronze ages of Europe, in D. L. Clarke (ed.) Models in Archaeology. London, Methuen.

Shinnie, P. L. and Ozanne, P. C. 1962. Excavations at Yendi Dabari, Trans. Hist. Soc. Ghana 6: 87-118.

Simmonds, N. W. 1962. The Evolution of the Bananas. London, Longmans.

Slobodkin, L. B. and Richman, S. 1956. The effect of removal of percentages of the newborn on size and variability in populations of Daphnia pulicaria (Forbes), Limnol. Oceanogr. 1: 209-239.

Slobodkin, L. B., Smith, F. E. and Hairston, N. G. 1967. Regulation in terrestrial ecosystems and the implied balance in nature, The Am. Naturalist 101 (918): 109-124.

Smart, C. D. 1962 (Sept.) Midden recording and sampling in the Waikane region, N.Z. Arch. Assn. Newsletter 5, 3: 160-169.

Smith, R. 1970. The Canoe in West African history, J. Afr. Hist. XI. (4): 515-533.

Smith, S. R. 1929. The Ibo People. Unpubl. Ph.D. thesis, University of London.

Sowunmi, M. A. 1973. A preliminary palynological study in the Rivers State, Oduma I (1): 13-14.

Sowunmi, M. A. 1975. Preliminary vegetation studies in the Niger Delta, Rivers State Research Scheme, 1st Interim Report, pp. 53-59, Ibadan.

Sowunmi, M. A. 1976 (Sept.) Polynological Studies in the Niger Delta. A Preliminary Analysis, Paper presented at the Niger Delta Conf. Sept. 1976, Port Harcourt.

Spaulding, A. C. 1971. Statistical techniques for the discovery of artifact types, in J. Deetz (ed.) Man's Imprint from the Past, pp. 43-57, taken from Am. Antiquity 18 (1953): 305-313.

Speed, E. 1969. Prehistoric shell collectors, S. Afr. Archaeol. Bull. 24: 193-6.

Stephenson, T. A. and Stephenson, A. 1949. The universal features of zonation between tide marks on rocky coasts, J. Ecology 37: 289-305.

Steward, J. H. 1936. Economic and social basis of primitive bands, in Essays in Anthropology Presented to A. I. Kroeber. Berkeley, Univ. of Calif. Press.

Street, J. M. 1969. An evaluation of the concept of carrying capacity, Professional Geographer 21: 104-107.

Struever, S. 1968a. Woodland subsistence-settlement system in the Lower Illinois Valley, in New Perspectives in Archaeology, ed. L. R. Binford and S. R. Binford. Chicago, Aldine Publ. Co.

Streuver, S. 1968b. Flotation techniques for the recovery of small-scale archaeological remains, Am. Antiquity 33, 3: 353-362.

Sukhatme, P. U. 1973. Human calorie and protein needs and how far they are satisfied today, in B. Benjamin, P. R. Cox and J. Peel (eds.), Resources and Population. London, Academic Press.

Sverdrup, H. and Johnson, M. and Fleming, R. 1946. The Oceans. 1st ed. 1942 N. Jersey.

Swalding, P. L. 1972. Shellfish Gathering in Prehistoric New Zealand. Unpubl. M. A. thesis, University of Auckland.

Tahal, 1962. Masterplan for Urban and Rural Water Supply. Enugu, prepared by Tahal (Water Planning) Ltd., Tel Aviv, Israel.

Talbot, P. A. 1932. Tribes of the Niger Delta. London.

Talbot, P. A. 1969. The Peoples of Southern Nigeria (4 vols.) Vol. III Ethnology. London, Frank Cass and Co. First publ. 1926.

Timitimi, A. O. 1970. Ijo Cookery Book, Ibadan, Inst. of Afr. Studies Occass. Publ. No. 28.

Thomas, N. W. 1913. Ibo-speaking Peoples of Nigeria, Part I. London, Harrison and Sons.

Thomas, N. W. 1918. Nigeria notes II: metalwork, Man 18 (100), 184-186.

Thorson, G. 1946. Reproduction and laval development of Danish marine bottom invertebrates, Med. dd Konm. f. Danmarks fiskeri og Havunders Plankton Bd. 4(1): 1-523.

Townsend, M. 1967. The common limpet, Folia Biol., Krakow 15: 343-51.

Treganza, A. E. and Cook, S. F. 1948. The quantitative investigation of Aboriginal sites: complete excavations with physical and archaeological analysis of a single mound, Am. Antiquity 13, 4: 289-297.

Tressler, D. K. and Lemon, J. M. 1951. Marine Products of Commerce. 2nd ed. N.Y., Reinholt.

Trigger, B. G., 1968. The determinants of settlement patterns, in Settlement Archaeology, ed. K. C. Chang, pp. 53-78, Palo Alto, Calif. National Press.

Uchendu, V. C. 1965. The Igbo of Southeast Nigeria. N.Y., Rinehart and Winston.

Ucko, P. J. 1968. Anthropomorphic figurines of predynastic Egypt and Neolithic Crete with comparative material from the prehistoric Near East and mainland Greece, Andrew Szmitha, London, Roy. Anthrop. Met. Occ. Paper No. 24.

Udo, R. K. 1963. A Geographical Analysis of Rural Settlements in E. Region of Nigeria. Unpubl. Ph.D. thesis (Geography), London University.

Udo, R. K. 1970. Geographical Regions of Nigeria. London, Heinemann.

Udo, R. K. 1978. A Comprehensive Geography of West Africa. London, Heinemann.

Unigwe, A. U. 1939. Fishing among the Anams, Nig. Mag. 18: 171-172, Lagos.

U. S. President's Science Advisory Committee 1967. The world food problems. Report of the Panel on World Food Supply, Vol. 2. Washington D.C.

Uzozie, L. C. 1975. Food crop combination and agricultural regions, in Ofomata, G. E. K. (ed.) Nigeria in Maps: Eastern Nigeria, pp. 103-105.

Van Noten, F. L. 1974. Excavations at the Gordon's Bay shell midden, South West Cape, S. Afr. Archaeol. Bull. 29: 122-142.

Van Z. Bakker, E. M. 1967. Upper Pleistocene and Holocene stratigraphy and ecology on the basis of vegetation studies in sub-Saharan Africa, in Background to Evolution in Africa (eds.) Bishop, W. W. and Clark, J. D. Chicago, pp. 125-147.

Van Z. Bakker, E. M. 1972a. A reappraisal of Late Quaternary climatic evidence from tropical Africa, in Palaeoecology of Africa 7 (ed.) Van Bakker, Balkena, Cape Town, pp. 151-187.

Van. Z. Bakker, E. M. 1972b. Palaeoecological background in connection with the origin of agriculture in Africa, Burg Wartenstein Symposium, No. 56: 1-21.

Van Z. Bakker, E. M. 1976. Palaeoecological background in connection with the origin of agriculture in Africa, in Origins of African Plant Domestication (eds.) J. R. Harlan, Jan M. J. De Wet, and A. B. L. Stemler. (In World Anthrop, Series by Sol Tax), Mouton Prbl., The Hague, pp. 43-63.

Van Z. Bakker, E. M. and Butzer, K. 1973. Quaternary environmental changes in Southern Africa, Soil Science 116 (3): 236-248.

Vita-Finzi, C. and Higgs, E. S. 1970. Prehistoric economies in the Mount Carmel area of Palestine: site catchment analysis, Proc. Preh. Soc. London, 36.

VCOAD1975. Food from the Sea: Facts about Development-3. Publ. by Voluntary Committee on Overseas Aid and Dev. Intern. Dev. Centre, London.

Vuillemier, B. S. 1971. Pleistocene changes in the fauna and flora of South America, Science 173: 771-780.

Wai-Ogusu, B. 1971. Quaternary climatic changes in West Africa: a review, Ghana Soc. Sc. J. I (2): 1-23.

Waitt, A. W. 1963. Yams, Dioscorea species, Field Crop Abstracts, 16, No. 3, 145-157.

Walker, I. C. 1973. Aspects of the Clay Tobacco-Pipe Industry from the Point of View of the Manufacturing Techniques and of the Changing Patterns of Trade and Smoking, and with Particular Reference to the Industry in Bristol. Unpubl. Ph.D. thesis, University of Bath, England.

Walker, I. C. 1975. The potential use of European clay tobacco pipes in West African archaeological research, W. Afr. J. Archy. 5: 165-193.

Watt, G. 1890. Dictionary of the Econ. Prod. of India. W. H. Allen & Co., London.

Wavell, P. J. Thermodynamics: a Book on Weight, p. 28 (n.d.).

Weathermax, P. and Randolph, L. F. 1955. History and origin of corn, in Corn and Corn Improvement (ed.) Sprague, G. F., New York.

Webber, M. J. 1971. Empirical verification of classical central place theory, Geogr. Anal. 3: 15-28.

Weber, K. J. 1971. Sedimentological Aspects of Oil Fields in the Niger Delta. Paper read at Tokyo Conference on Oil, 1971. Publ. In Geologie En Miunbouw 50 (3): 559-576.

Weber, K. J. and Daukoro, E. Petroleum geology of the Niger delta, P.D. 4 (1), 209 ff.

Weekly, M. 1950. Dolls and dolls' houses, Victoria and Albert Museum Publ.

White, C. M. N. 1965. A Revised Checklist of African Birds.

Willet, F. and Connah, G., 1969. Pottery Making in the Village of Use Near Benin City, Nigeria, Baessler-Archiu. XVIII: 133-149.

Williamson, K. 1970(April). Some food plant names in the Niger delta, Intern. J. of American Linguistics, XXXVI (2), 156-167.

Woodburn, J. 1968. An introduction to Hadza ecology, in Man the Hunter (eds.) Lee, R. B. and Devore, I., pp. 49-55, Chicago, Aldine.

Woodhouse, H. C. 1971. Archaeology in Southern Africa. Cape Town, Purnell.

Wrigley, C. 1970. Speculations on the economic prehistory of Africa, in J. D. Fage and R. A. Oliver (eds.) Papers in African Prehistory, pp. 59-73.

Yonge, C. M. 1975. The Sea Shore. 10th impression. Fontana. First publ. 1949.

Yonge, C. M. and Thompson, T. E. 1976. The Living Marine Molluscs. London, Collins.

York, R. N. 1973. Excavations at New Buipe, West Afr. J. Archaeol. 3: 1-189.

Ziegler, A. C. 1973. Inference from prehistoric faunal remains, An Addison-Wesley Module in Anthropology, No. 43. Addison-Wesley Publ. Co. Inc., Philippines.

Zubrow, E. B. W. 1971. Carrying capacity and dynamic equilibrium in the prehistoric Southwest, Am. Antiquity 36, 2: 127-138.

Zubrow, E. B. W. 1972. Environment, subsistence and society: the changing archaeological perspective, Annual Review of Anthropology I: 179-206.

Zubrow, E. B. W. 1975. Prehistoric Carrying Capacity: a Model. Cummings Publ. Co., Menlo Park, California.